THE PROCEEDINGS

OF THE

UNITED STATES NAVAL INSTITUTE.

Vol. XXXII, No. 1. MARCH, 1906. Whole No. 117.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

PRIZE ESSAY, JANUARY 1, 1906.

PROMOTION BY SELECTION.

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Motto: Look before you leap.

The professional atmosphere is again alive to the whisperings of promotion by selection. Like some planetary orb, "selection" has its seasons of approach and recession, and at present it appears to be on its way toward perihelion.

Its claims are pressed upon our attention, sometimes by direct exposition, sometimes indirectly by suggestion. A number of officers openly advocate it and there are reasons for believing that it finds encouragement in the higher circles of government, both legislative and executive. On the other hand, it is opposed by a large number, possibly a majority, of officers who feel that its adoption would be a serious, if not a crushing, blow to the best interests of the service.

There are some who sincerely feel and believe that they will not get what is rightfully "coming to them" *without* selection; and there are others who feel and believe with equal sincerity that they will not get what is rightfully "coming to them" *with* it.

In the presence of such diametrically opposite views, the hope may not unreasonably be entertained that a free discussion of the

important points involved will, at least, disclose prevailing service opinion and possibly settle some minor elements of the topic.

In entering upon such a discussion it can be confidently assumed that the highest welfare of the service constitutes the common ground upon which all would wish to stand, and that to attribute to anyone a motive inconsistent with such welfare is, in itself, sufficient to merit reflected censure.

It is difficult to believe that there is anyone so self-conscious of unworthiness that he fears the application of any uniformly applied fair rule; and, *per contra,* it is equally difficult to believe that there is anyone so lost to sense of honor and patriotism that he would willingly abandon these virtues and enter deliberately into base schemes of self-seeking. We may reasonably agree that the possible number of both these classes, occupying the very extremes of unworthiness, is so small as to be negligible.

So much has been said from time to time upon both sides of this fruitful question that one feels pardonable in avowing at the outset that no attempt has been made to review the entire field of its literature. The attempt has been rather to discover, if possible, the chief principles and reasons that have inspired those who advocate selection in either its fullness or some modification thereof, and to examine these reasons as to their force and validity.

The result of such search for fundamental principles as time permitted, disclosed four grounds upon some one or more of which the various arguments in favor of selection seemed ultimately to rest. These may be stated without particular regard to order of importance as follows:

1st. *Selection is desirable in order to obtain and keep younger officers in the grade of commander and above.*

2d. *It is desirable as supplying reward to deserving officers.*

3d. *It is desirable in order that those having the higher professional qualifications may occupy the places involving the greater responsibilities.*

4th. *It is desirable because it would stimulate energy throughout the service and thereby promote efficiency.*

YOUNGER OFFICERS IN THE GRADE OF COMMANDER AND ABOVE.

In taking up the first of these principles, which may for brevity be designated the "younger men" theory, it is desirable to explain at once that the caption scarcely deserves a place, on its

merits as a principle, in this discussion. But those who advocate selection so frequently refer to the benefits it would bestow in bringing younger men into the upper grades that it seems necessary to look into the matter, if for no other purpose than to clear the field of confused issues. There is, in fact, no essential connection between the desirability of having younger men in the upper grades and the means of getting them there. It is obvious that even if we agree as to the need, we may still disagree as to the means of supplying it. Selection is only one method among others.

When selection is urged upon us for the purpose under consideration, it is usually prefaced or accompanied by a vivid description of an alarming attack upon some city of our seacoast, and our present condition is represented as providing only antiquated admirals and decrepit captains for its defense. The end is clearly seen from the start, and we save time here by admitting disaster at once without going through the distressing details. Younger men would have saved the day, and, according to the theory, enough of them, at least for such an occasion, should have been selected from the lower grades and placed where they would have been available on demand.

Do we interpret the thought correctly in believing that they want a few young men sprinkled in among the older ones, ready in emergency to actually take the wheel and relieve their incapable associates? This is not probable. For, apart from the anomaly of such a travesty of organization, it is open to the obvious comment that if a few younger men are so serviceable, then *more* younger men would be still more serviceable and the necessity of the reliefs would be avoided.

Do they desire younger admirals over captains who are their seniors in age and experience? It is not reasonable: for surely the duties of a captain are more exacting, physically, than those of an admiral. And similarly, the duties of an executive officer are more exacting physically than those of higher positions. So we seem driven to the other horn of the dilemma and must assume that *all members* of the upper grades should be younger. We then realize that this may be readily brought about by the establishment of appropriate age limits in the several grades. This leaves the issue of selection still as unsettled as ever and merely warns us that the question of younger officers should not be permitted to confuse or obscure it.

And here seems a suitable place to invite attention to the very prevalent error that the incumbents of the higher grades are incompetent, physically, mentally, or both, because of age. This is far from the truth. The rare instances that seem to support such belief are marked exceptions. This false alarm has been overworked. An unprejudiced survey of our captains and flag officers will develop the fact that they are a capable body of men ready for any contingency of service. In fact, such capacity is not rare on the list of those retired for age. If there is any question involved it is one of neither physical nor mental incapacity, but purely of administrative expediency. It may indeed be that the age limits for lieutenant-commander, commander, and captain need to be lowered; but if so the reason is to accelerate promotion in the lower grades and give opportunity for more experience in the higher ones, and not at all because of declining powers due to age.*

There is something in the mere fact of attaining the higher grades and thus reaching full length of service that, of itself, proves fitness. It is a kind of natural selection whose exacting requirements determine more certainly than do any other means an all-around fitness for responsibility and command. Many things may affect ultimate fitness that are undeveloped and hence cannot be detected in the earlier years. There are weak points in character, obscure elements of physical ailment, lack of staying power in either physical, moral, or intellectual fields, that too often develop into practical disqualifications.

What particular merit has youthfulness in supplying the qualities of an admiral? Are experience, wisdom, and judgment characteristics of youth? For *physical action* we need the enthusiasm and energy of younger men. In fact, we concede willingly that our commanding officers should have the stamina and physical energy of meridian manhood. Their duties involving loss of sleep, unending vigilance, and frequent exposure, can be performed satisfactorily only by men of vigorous health. But these physical demands do not fall so heavily upon admirals.

Hot blood for *action*, but cool blood for *council*, under all circumstances, not excepting war. A man of sixty years would

* In connection with the age question attention is invited to the current report of the Secretary of the Navy, published since the above was written.

probably not be the best to lead a cutting-out expedition, but he might easily be the best to plan one. The dashing young hero who leads it successfully might easily mar his own plans in their preparation by over-eagerness and enthusiasm. The man immediately behind the gun, and in the fire-room, needs emphatically the energy of youth to stimulate exertion and endurance. But the man of the cabin, of the conning tower, and of the bridge, needs that familiarity with emergencies which experience, and *experience alone,* can give, and which steadies his judgment and gives him confidence.

It would be easy, but it is unnecessary, to quote from history long lists of instances where leaders over fifty years of age have won great victories. It is sufficient to recall the work of our own Farragut, and of those who conducted the naval campaigns of the war with Spain.

The following quotation from a leading daily newspaper of recent date, in an article commenting upon the age of officers in the upper grades, is worthy of notice as indicating a surprising trend of thought among reformers:

"Experience in lower rank no longer fits for promotion." There can be no greater perversion of truth than this statement; and it is just such loose utterances that engender the belief among the civil officials of government that "selection" is superior to experience. Experience in the successive lower grades is as beneficial and as necessary to-day as it ever was in the history of navies, for the development of the all-around thorough officer, master of his profession and fitted for meeting emergencies. In fact, *the one objection,* worthy of consideration, to the lowering of grade ages is that it reduces this preliminary experience.

SELECTION DESIRABLE AS SUPPLYING REWARD TO DESERVING OFFICERS.

We will now consider selection as a system that enables us to reward deserving officers. This has always been a favorite ground for its advocacy. History is replete with records of rewards and honors bestowed upon successful commanders, and special promotion, or advancement, is usually the means by which extremely hazardous or important duty and extraordinary heroism are recognized. For such services our laws provide rewards of that kind.

The propriety of such advancements when the deeds are commensurate with the high purpose of the rewards will rarely be questioned. But such deeds are necessarily unusual and infrequent; else they would be ordinary and not extraordinary. They must be deeds that approach the very limits of human endeavor and courage to merit the descriptive terms employed; and so long as special advancement is limited to such exceptional and deserving cases we can give unanimous approval.

But if rewards of any kind are given too liberally, or if we attempt to grade them to meet the estimated merits of less worthy services, we defeat our own ends. The value of even the highest reward then becomes degraded, and the hopeless attempt to discriminate among the minor services leads at once to confusion, injustice, and favoritism. Selection for reward, accepted as a general principle of promotion, would lead immediately to these disorganizing and destructive conditions. To lower the standard is, at once, *to lose* the standard and imperil ourselves.

The scheme to introduce promotion by selection whereby zeal, energy and accomplishment may attain immediate reward is attractive in theory but illusory in practice. Luck, opportunity, circumstances and environment are elements that enter so largely into the ordinary events of life, military no less than civil, that human judgment is baffled and thwarted by their operation.

We may contemplate, for example, a soul-stirring act of heroism where life itself is deliberately and obviously carried to the altar of duty; and on the other hand we may have for illustration the possible case of Ensign "Bluffy." Sent on some duty to a remote part of the ship, he discovers an incipient fire in paymaster's stores lying in the passage. Turning quickly in his excitement to give the alarm, he stumbles, falls, bruises his thumb, and upsets a bucket of water from a rack where it had been placed by the executive officer for just such a contingency. Reminded by the water of its usefulness he finds a second bucket and completely extinguishes the flames. In the meantime a petty officer, aroused by the noise and seeing the smoke, has given the alarm. When the first nozzle-man reaches the scene it is all over. "Bluffy" has entirely forestalled him. His thumb is carefully bandaged by the surgeon, and at the end of nine days, being of robust constitution developed by football at Annapolis, he is on duty as usual.

Between these two extreme types of performance all acts of

service may be grouped, but they cannot be justly graded. Furthermore, an individual act of undisputed merit will be weighed very differently by different superiors. With one it may rank as heroism, with another as commonplace performance of duty to be expected of any good officer. By the skillful and kindly services of interested friends an incident of service may be inflated to the dimensions of an omelet, while under less favorable circumstances another's cake becomes dough. Mere eye-service sometimes imposes upon a superior, while modest and constant staying powers are unobserved. Unfortunate misunderstandings and prejudices from which none is free, often lead commanding officers into error in judging the character and qualifications of their subordinates.

Under a system of selection for reward "Bluffy," no doubt, will be advanced over many of his associates on the ground that he is an enterprising man who "does things," and deserves encouragement.

While such general considerations would seem clearly sufficient to condemn the reward theory as a general method of promotion, its disadvantages, not to say evils, are equally manifest when we look into its practical application at closer range. At the conclusion of the Spanish war, for example, numbers of officers had done distinguished service ranging to the very highest measure of worthiness. The large-hearted enthusiasm of our countrymen for their soldiers and sailors, always so manifest in the presence of war, moved them earnestly to the bestowal of reward. Advancement in rank seemed at once to be the natural, simple, and appropriate form for the expression of the recognition; and, in general, the movement was accepted ungrudgingly by the service at large. Accordingly, the "jumping" began. As a result of later reports and revisions the jumpers were themselves jumped by other jumpers, and the measure was in danger of defeating its own ends. One was reminded of the famous problem of the frog escaping from the well. It could jump up three feet in the day time but slid back two feet every night. The bestowal of these rewards led immediately to confusion and unexpected difficulties affecting regular promotions.

Not only this, but the natural feelings of justice and generosity within the service itself, among those who were rewarded, induced individuals thus benefited to write official letters of protest in behalf of the interests of their less fortunate comrades.

If such great dissatisfaction results when advancements are made by the operation of existing law and upon the basis of generally recognized meritorious conduct and gallantry, more certainly will there be dissatisfaction in time of peace when the only basis is the opinion of a board.

The subject of "reward," by itself, is so pertinent to this topic that it may not be amiss to glance briefly at its motives and effects as it pertains to military service. The most common motive in giving rewards is, probably, to encourage people to right conduct and endeavor. We give them liberally to children both in the home and school in the form of toys, money, etc. Later, as character develops, we rely less and less upon these artificial aids until, in mature life in noble characters, their necessity becomes rare. Rewards are given for the return of stolen and lost articles and there can be no doubt that this practice is beneficial in maintaining and promoting honesty. But the man or woman whose character in this regard *is already strongly developed* declines the reward under the feeling that its acceptance is in some sense humiliating, involving possibly the admission that it is trading character for material gain.

In naval and military service the one object of effort to which all are urged by precept and example is the performance of duty. It is the watchword of our service. It is the pillar of cloud by day and of fire by night. It is an end so worthy and satisfactory in itself that it needs no tinsel tag. Shall we displace the pure motive of duty by the baser motive of reward as an inspiration for our young officers? Poets and philosophers who study fundamental causes reach conclusions that are verified by our observation and experience, and all unite in attributing success in arms, as in any other supreme endeavor, to the integrity of character and to the pure motives that are covered by the outward armor and material weapons.

No position in the navy exists as a reward for service however distinguished or however commonplace. The positions exist primarily and only because of important duties that must be performed and heavy responsibilities that must be borne for the general welfare. Promotion to advanced grade *merely as a reward for service,* however gallantly accomplished, is unwise. If the service rendered assures us of the competency of the officer to perform satisfactorily a higher class of duties for which a call or

a vacancy exists, then naturally give that man, who has proved his competency, to the place. Do not give the place to the man. If the performance of a duty merits the honor and applause of the people, these will be accorded in full measure, whatever the rank or position of the individual.

The word "reward" has attained wide currency in connection with the subject under discussion. This seems regrettable. The very meaning of the word as given by standard authorities embodies the ideas of recompense, compensation, remuneration, pay, requital, etc., and these are alien to the ideal of military duty. The word "gift" or "present" would be less objectionable from this point of view.

But must they have reward? Are rewards desirable for adults? Are they desirable for a body of men trained and encouraged from youth to act from motives of honor and duty alone? Is not the practice, said to exist in Japan, whereby rewards are not given even for the bravest personal sacrifices, more glorious and more effective?

Does the officer want reward? Does he seriously deem his country to be his debtor? Then let us provide a money reward from the public treasury. But does he look askance and hesitate in the acceptance because it seems sordid, or base, or belittling? He need not. Rewards in money are common elsewhere in life. In fact, money reward for military service is by no means unknown in other countries. Possibly the objectionable feeling is due, in reality, to the *reward itself,* and that it is the attempted measurement of supposed deserts by money that makes the repugnance manifest. But if a money reward is objectionable, then surely no one would seek the reward of *advancement, that takes money from his comrades,* and, in addition, is unjust to them in other ways.

Does he want reward? Does he fear that his name may not survive in the hearts of his countrymen? Indeed it may not. Republics are proverbially ungrateful. Let him then have it carved on a bronze tablet, or marble column, or impressed upon a medal.

It would be going too far to assert that under no circumstances should there be special recognition of important military service. Such assertion is distinctly not made. But it is contended that enough is shown to make us exceedingly cautious in bestowing

rewards; that they should never be used *as a basis for general promotions;* and finally that the ideal of military and naval duty should be so exalted and rigid as to need no support by them.*

In reply to those who may think such standard too high to be practicable, we may point to the honorable records in our naval history. They will find that it was not too high for our predecessors; and it was reached in these later times, as shown by a letter to the President, written in behalf of others, wherein it is said:

"... I have felt that I have done my duty in the conduct of the West Indian naval campaign to the utmost extent of my ability, as thoroughly as I was able, and if no reward should come that I could be satisfied with the consciousness of having done my best. ..."

THOSE HAVING HIGHER PROFESSIONAL QUALIFICATIONS SHOULD OCCUPY THE PLACES INVOLVING THE GREATER RESPONSIBILITIES.

The central idea of this heading may be expressed more briefly as the theory of "the best man on top." It is attractive in appearance and honest in purpose. But appearances are not always reliable as a basis of judgment; and the advantages claimed in having our officers graded in a list according to their individual professional merits are not so obvious as might seem at first glance.

We shall assume for discussion, at this point, a perfect graduation the accuracy of which no one will question. How shall we put our machinery in operation to fulfill its avowed purpose of giving the most important duty to the best man? First of all we should assure ourselves of the place or places where responsibility bears most heavily. This, in itself, is a problem involving no little difficulty. It may seem to be in China waters to-day and develop suddenly in Africa to-morrow. It would probably be deemed neither wise nor expedient to keep the ranking individual on the move following up the points of possible trouble. We might also reasonably assume that cruising duty, in general, involves greater responsibilities than shore duty. Would we, therefore, send and

* ... "The disposition to complain of the rewards of military service is at least as old as Christianity, and that the remedy for it was in the beginning the same as now, namely, to urge the faithful performance of duty without regard to reward." (A. and N. Journal, June 10, 1899.)

keep all the upper men of the various grades at sea? Manifestly not. In due course reliefs would have to be provided and our theory would then be exactly reversed in application. In actual practice the assignments to duty, in all probability, would soon reduce themselves to the very conditions under which we work to-day. Not the *ranking* man but the *best available* man would be assigned. Commanders of fleets and squadrons, captains of battleships and armored cruisers are now so chosen, and so on down, with more or less choice, through the various posts of responsibility. This is done now with a list, which, according to selectionist doctrine, is unsatisfactorily graded. What different course would be followed if the list were perfectly graded?

The list, however well arranged according to the best selection theory, would *never be taken in the emergency of war,* and hardly in the routine work of peace, to give us commanders-in-chief or captains of battleships in their order of standing. Then, as now, and as in times past, the President and his advisers would go over the list and under the stress of necessity would still seek from its large numbers the particular man for the particular place. Here there will always be a selection willy-nilly; a selection contemplated by existing law. Why then keep the list in an unsettled turmoil that in the end obviates nothing, and in the meantime accomplishes little else than discontent and harm?

The mistaken notion as to the advantages of perfect grading results from the fact that in the service there are numerous posts of duty and many different classes of duty in simultaneous existence, and largely independent of each other. If there were but *one duty* to be done, involving but *one organization,* like a regiment or a single ship, there might be some convenience or advantage in having the list in strict keeping with the grades of duty. Such, however, is far from being the case.

But, further, if we should all agree as to the perfection of the grading at any time, it is certain that opinions would change and the list would never be in an established condition.

A list, after all, is merely a group of names, but it is often very necessary. When the names of a number of people are presented for consideration they have to be arranged in *some* order. When a body of people pass through a doorway one at a time, recognized order is very desirable. But there are many bases of arrangement other than ability that give satisfactory results. A company com-

mander might be able to write a list of his men in the exact order of their qualifications as soldiers. But for most purposes he might still prefer to use merely an alphabetical list; and in forming his company he probably would give no regard to either. For one kind of duty one man would be his "best" soldier, and for another kind of duty, another. It would seem then that the importance of any special order in a list of names may be exaggerated.

But, if grading by merit is insisted upon as desirable, we are brought to a consideration of the crucial question in selection. By what means can we accurately determine the relative merits and worth of officers? Can these things be satisfactorily measured in any way by any body? It is scarcely possible. After a great war we may be able to pass acceptable judgment in some cases upon individuals, but even after such great test our judgment may involve grave errors. We cannot be certain that luck may not have entered largely into the careers of our pronounced successful men; luck, that might easily fail them in a second trial. We cannot be sure that others may not have gone down to defeat because of unavoidable mischance rather than because of incompetency.

The insect most gifted among its fellows by physical perfection and high development may be suddenly crushed by the footfall of man, the dropping of an apple, or the bursting of a storm. Its truest instincts and best actions are subject to conditions that can be neither foreseen nor evaded. So with man in his larger sphere and his accompanying larger contact with enveloping circumstances.

Who can select the great leaders *before* they have *proved* that they *are* great leaders? Who heralded Grant or Lincoln? The fact is that great leaders select themselves. They join with opportunity to show and prove their fitness. Furthermore, the men who are ultimately accepted as great by the estimate of history and the approval of posterity are often unappreciated by their contemporaries, and quite as often the reciprocal is true.

There is no adequate test of superiority as a military or naval leader except the great and ultimate test of real war itself. The maneuvers, the sham battles, the mobilization of armies or of fleets, for mere practice, are wholly unreliable for the discovery of those grim war qualities that may lie dormant only to be aroused to action by the call to arms for business.

Can the advocates of selection hope to arrange the upper grades of the navy list in an order that accurately measures ability in this ultimate purpose of all navy work? Such difficulty is well illustrated and apparently well recognized at the Naval Academy. Here we carefully grade the classes, giving appropriate weight to each subject, having in view the qualities of an ideally equipped naval officer. After three years of this careful grading the first class enters upon its important work. How are the cadet officers appointed? Are they taken in order from the carefully graded list? Decidedly not, and with good reason. Further, at the close of the fourth year, when we have had opportunity to judge the class as cadet officers and could arrange them in order according to their performance of duty alone, do we do so and give them to the service in that order? Decidedly not, and for good reasons. Without discussing what is done, or what ought to be done, we notice the conservative view finding its expression in long-continued custom that it is neither expedient nor wise to try to arrange a class according to their all-around fitness as officers.

And even in mature years how unstable is mere "success" as a pedestal upon which to place our heroes and worthies while they are yet living to overturn it by their unsteady antics. Was the Bonaparte of Italy and the Bonaparte of Egypt the same man? What is left of Marengo and Jena after the retreat from Moscow? Even in this generation we may call to mind a commander of the highest reputation in the navy of a great nation who, by an unaccountable lapse, brought fatal disaster to his fleet in time of profound peace, and escaped malediction only through a gallant death with his comrades.

As among very divergent qualities, who can judge rightly which is entitled to the greater weight? Of two flag-officers, which serves his country best; he who, as an acknowledged expert tactician, can handle his ships with precision, maintain discipline, and promote efficiency, but who is remiss in knowledge of international law, blunders stupidly in diplomacy, and may needlessly involve his country in war; or he who, as a master of tact, diplomacy, precedent, and law, averts from his country a great war, though he is admittedly weak as a drill-master?

How many commanding generals were "selected," only to be displaced, during the first few months of our Civil War? And

why was our great general so long undiscovered by both the civil and military experts on ability?

Such incidents and questions as the preceding seem to indicate the absolute futility of attempting to solve the complicated problem of human merit in any exact manner.

The difficulty of "picking winners" from among the personnel of naval and military establishments is by no means exceptional. Similar attempts in other fields of strenuous exertion usually prove to be a fruitful source of disappointment to all concerned excepting those who control the operations. "Favorites" often "go stale;" "unknowns" develop unexpected qualities; and "ringers" too often are worked into classes and win prizes to which they are not entitled. The chief result upon the community is widespread vexation of spirit.

But if results are so uncertain in mere physical contests, where every care is taken to make the conditions uniform, where the course is exactly the same for all, where one quality and one only is on trial; how hopeless must be the attempt to make correct choice where the conditions are widely different, where no two courses can be alike and where a score of qualities enter into the issue to be weighed and measured against each other.

The views of General Grant upon this subject cannot be without value to the discussion. In his book "Around the World with General Grant," Vol. II, p. 351, John Russel Young quotes the General as follows:

> I am always indulgent in my opinions of the generals who did not succeed. There can be no greater mistake than to say that because generals failed in the field they lacked high qualities. In the popular estimate of generals nothing succeeds like success. . . . . Some of the men who were most unfortunate in our war are men in whom I have perfect confidence, whom I would not be afraid to trust with important commands. It is difficult to know what constitutes a great general.

SELECTION DESIRABLE BECAUSE IT WOULD STIMULATE ENERGY THROUGHOUT THE SERVICE AND THEREBY PROMOTE EFFICIENCY.

In the PROCEEDINGS OF THE INSTITUTE, September, 1905, there is presented a "modified system of promotion by selection" based upon the ground defined by the above sub-title, the last of the four to be specifically considered. It is clearly stated that the scheme

is "designed as a spur to action to a large class of men. . . ." Although disagreeing with several of the statements made in advocacy of the system proposed, we may well admit that the case is strongly presented and that its supporters have unquestioned confidence in the efficacy of the plan. It is referred to here because it is a fair type of the various schemes proposed having the same motive.

But let us look at the motive and method of application. In this aspect selection presents itself to us as a mechanical, or at least, an artificial, agency brought into the service to perform the part of an energizer. It would seem to be a sort of bugaboo, or incorporeal policeman, to incite fear and make us "step lively." Perhaps a more acceptable comparison would be to liken it to a stimulant that induces desired physical or mental energy when the normal powers have become fatigued or are inadequate to our needs. It would also appear that those who support selection on the basis now under consideration are not really selectionists at heart, for the hope is plainly held out that if the plan works well there will be little or no selection and promotion will continue by seniority, as heretofore. Selection apparently is not regarded as a wholesome diet, but is to be taken as a tonic to brace up the system.

Artificial stimulants, however serviceable at times and for special purposes, have recognized faults when used habitually. They rapidly exhaust the vital powers, and the system becoming accustomed to their presence demands larger supplies to maintain the desired effect. Would not this be true of selection? If we should start with even a little selection, would we not experience its possible evils along with its possible good, and would we not find ourselves in need of larger applications as the service became accustomed or callous to its effects? Would not the sensual palate, represented here by self-seeking interests, demand excess of stimulant to the great detriment, and against the protest, of the other members of the organism?

There is no doubt that the energizer proposed would produce effect. But would the effect be of a satisfactory and desirable kind? There might be more activity. There certainly would be more showy performance, more subserviency, more eye-service, more gallery-play. But would the healthy tone and vital qualities characteristic of a loyal service be improved? It is more than

doubtful. Increased energy does not spell increased efficiency. A mouse, for example, can energize a herd of elephants into frenzy. It can throw a missionary meeting into panic. But in neither case is the energy productive of benefit.

Moreover, we cannot forget that while selection may be an energizer it has strong re-active properties. One can scarcely conceive of a more certain way of quenching the zeal and killing the spirit of any nine good men than by advancing the tenth one over them.

We must consider also the increase of official machinery that apparently must accompany selection methods. One proposition contemplates a special board for selecting vice-admirals, a continuous board of five rear-admirals to make selection for that grade, and a second continuous board of five captains to make selection for captains and commanders. These numbers seem excessive, but are possibly deemed necessary to insure the service against any deplorable mistake.

If selections are made quarterly, as it is suggested, we have before us the probability every three months of interesting topics for gossip and criticism. There would be whisperings, comment and mutterings throughout the service detrimental to discipline and disorganizing in tendency.

It might easily happen also that the department, unable to anticipate the action of the selecting boards would find itself embarrassed in making assignments to serious duties. An officer, for example, appointed to an important ship or post for a reasonable term of service, is selected to a higher grade before he has fairly grasped his command. He must then be relieved. Frequent changes of this kind are undesirable for the service and vexatious to the detailing authorities.

Selection is sometimes urged, not so distinctly on the ground that it would improve good men, but on the somewhat modified ground that the unworthy would not be promoted. We are, therefore, entitled to ask; are the unworthy promoted under the present system? Let any one run over the list and feeling, if possible, full responsibility count how many he would have the assurance to cut out and so to advocate before a committee of officers. Is there not at times too much irresponsible talk about incompetents in the upper grades? But, for the integrity of discussion, let us admit that a few may be pronounced unworthy.

How did they attain promotion? A board of officers of high character, of patriotism, of courage, has pronounced them physically, mentally, and morally fit for their places. The opinion of the board apparently is different from our own. Thus the question is seen to be one of mere *opinion* rather than of *fact.* Can we charge that the board is unfaithful or incompetent? Has an unworthy candidate been permitted to pass with its full knowledge? If so, then we must admit that sworn boards are not reliable. They cannot turn down a known inefficient or unworthy man. Then, in reason, we are forced to believe that these same boards will not be able to resist the pressure of interest, relationship, political and social considerations, and the temptation to put themselves in position of future advantage, in making selections upward. If there are not nerve and stamina enough to keep out the manifestly incompetent, there will not be courage to resist the insidious temptation to promote a man for trifling reasons, which in the very nature of things can never be brought to the light of day.

It is unnecessary to introduce any artificial spur for the unworthy. It is not the spur that we lack, but its application. There are natural and efficient spurs already at hand in the organization. Let Courts-martial and Examining and Retiring Boards do their duty with vigor, with constant consideration for the uplift of the service, with less compassion for moral weaknesses, with less frequent recommendations to clemency: Let official reports of fitness be made with still greater discrimination, sharpness and emphasis, and the laggards and delinquents will be eliminated.

The worthy need no spur and should not be goaded.

On the other hand, what have we to offer as an inducement to effort; as encouragement for zeal? Frankly and plainly, nothing. These motives, if they exist, are also to be found within the system itself. They are in the mind and heart of every officer worthy of his training and his uniform. By favor, or merit, or both, he is called to honorable service in a profession already made illustrious by his predecessors. Assured of a competence that places him beyond the reach of want, it is his good fortune to know and feel the life of duty and service, to be in close touch with those who labor, and at the same time to enjoy the fullness of life in social and official circles beyond the reach of the many.

Common gratitude alone should stir him to honest endeavor; patriotism should make the performance of duty a sacred trust; and the rich traditions and splendid achievements of the past should inspire and sustain him on supreme occasion through the end of all human service.

If officers are not moved by these fundamental and vital considerations, then external and artificial devices will be worse than useless. They will further weaken and degrade. If we should ever reach a condition where such wholesome principles are no longer potent for good, we will have indeed a fruitful soil for the development of all that is evil in selection.

"SAFE SELECTION" HAS ABUNDANT APPLICATION IN THE SERVICE AT PRESENT.

Having now considered the chief grounds upon which selection is usually advocated, we will present other phases of the subject that seem to deserve notice.

Throughout the entire domain of life there is a process of selection by the elimination of the unfit, the weak and the unfortunate. It operates with uniformity and universality, and so long as human methods for obtaining good products conform to nature's method there is little danger of going wrong. Trees, for example, may be selected from a nursery for an orchard. While young they may be transplanted with ease. If one dies its place is readily filled; if some show but little vitality they are uprooted and others put in their places.

The *best chance* of having a good orchard is merely to see that *no bad trees* are carried. As the trees approach maturity we may know which yield the better and more abundant fruit. But no good orchard is ever made by selecting and transplanting such trees. The period for performing this operation with safety and success is past.

Our present method of maintaining the line personnel of the navy appears natural, reasonable, and adequate. Young men are chosen, first of all, from every part of the country, with at least some discrimination, by those empowered to appoint. From these *selection* is made on the basis of health, and still again on the basis of intellectual qualifications. They undergo a further process of rigid selection during four years of training at Annapolis, under conditions of justice and fairness unexcelled in the

world, by which there is an elimination of about forty per cent from the rolls. Passing thence into the active duties of their profession their official records are carefully noted from year to year and filed in the department. During these years there is a further elimination of the physically unsound, of those who develop weak character or bad habits, and of the culpably inefficient.

"*Safe*" selection does not end here. As officers approach command grade their professional personalities are recognized. The directions in which they excel, and the lines along which they have developed, as well as their points of weakness, have begun to manifest themselves. They will be called to positions and "selected" for duties for which they have shown marked ability. In the grades of captain and admiral assignment to special duties and important commands will be made, as now, by selecting the most competent man available. Little attention will be paid to the graded place a name happens to occupy on the register in making these assignments. Finally, the President, by statute, may select any officer not below the grade of commander and assign him to the command of a squadron.

Thus, it would seem, the country has full advantage of all that can reasonably be expected from a safe system of selection carried to the utmost point of propriety. What better conditions for efficiency can one desire than a body of generally recognized capable men in the higher grades from which selections for important duties may be made as required? And, be it observed, these selections are smoothly accomplished without setting people by the ears through the positively ungracious, and probably untruthful, assertion every few months that certain individuals are not quite as good as certain others.

COMPARISON OF CIVIL AND MILITARY CONDITIONS.

In the extended application of safe selection to which the service is subject, is found the answer to the question, so often asked by civilians, as to why promotion by seniority is the rule in the navy. They call attention to the competition for place that exists in business pursuits; to the obvious interests of the management in bringing to the front the best talent among subordinates; and express surprise that any system, other than selection, should find favor anywhere.

It is well known, to begin with, that advancement by merit

alone, to desirable places in business establishments, is by no means closely followed. The higher positions are filled, in a large proportion of cases, by relatives and connections of the financial backers; and often outside parties, with little or no experience, are brought in to secure advantages and interests to the concern, by indirect means, while faithful and competent employes are retained in low places on small salaries.

In the second place the conditions in civil pursuits and in the naval profession are very different. In the navy, just and fair selection by elimination has already done the important work, leaving a sound corps from which the benefits of any further selection upward are doubtful; while in civil life the selection of an energetic and capable man from a promiscuous ungraded body of employes may be as easy as it is advantageous.

OBJECTIONS TO PROMOTION BY SELECTION.

In controverting the propositions upon which selection is usually based, we have at times, incidentally but unavoidably as it seemed, anticipated some of the direct arguments that may be urged against the system. But the objections to selection are so generally known that, in what follows, the attempt is little else than to give formal completeness to the subject.

(a) *Corrupting and disintegrating effects of personal, social, and political influences.* It needs no argument to convince anyone of the destructive effects of favoritism and injustice upon the morals of any human organization. It is more to the purpose to convince people that there is no possible way to eliminate these influences from the machinery of any selecting agency. If the selection is left to one or more persons not of the naval service proper, who can never hope to understand or appreciate the sentiments and conditions peculiar to the profession, things too elusive for definition, we know by all experience within and without government circles that these evil influences would soon assert full sway. The very liberality of our government institutions and the facility with which people of all classes have access to the appointing power, constitute a field of opportunity most attractive and inviting to those who study to advance themselves by dispensing favors to both friends and foes.

Nor can we hope to fare better by setting up selecting boards within our own membership. We would still have to contend

with the strong forces of personal and service friendships, and family ties. It would engender a spirit of subserviency, and breed parasites and trucklers, instead of developing manly independence of action and opinion. The board itself would become the target of insidious approach, if not of direct assault, from without; and the action of individual members would be constrained by regard for their own future. It is a fine thing, indeed, to be able to stand firm against great temptations, but it is safer for most men to avoid them.

Even if selections were made with justice and exactness in fact, who can certify this fact with conviction to those interested? And we cannot forget that the essential damage is actually accomplished when there is suspicion of motive, and lack of confidence in the result, even if they are but groundless apprehensions.

The following passages quoted from articles in the "Army and Navy Journal" present strong views against selection:

The violent ups and downs in relative rank of commanders can scarcely be conducive to harmony and good-will among those high officers which are essential to success in war . . . . is there not something in the situation which suggests or invites officers to assist the President? And when the pressure is started does it not compel candidates in self-defense even against their inclinations perhaps to enter into the strife for advancement? . . . . May it not be noted also that the greater a soldier's ambition the keener will be his sensitiveness to injustice and humiliation. . . . . (May 10, 1902.)

The trouble is that the ways of the seeker after undue preferment are such that the bestower of favors does not always when he is affected by (?) what influences affect him. The President can hardly be expected to make the acquaintance of every officer and he is not necessarily competent to judge in all cases as to the relative merits of individuals. He must necessarily depend upon the reports that come to him and it is impossible for him to determine whether or not the elements of political or personal influence have affected these reports. (Nov. 23, 1901.)

If an avoidance of personality did not compel us to refrain from comparisons we could easily show what excellent reasons the army have for this distrust of selection. . . . . If the selection made upon short acquaintance does not prove to be a happy one the officer continues longer in a position to which he is not adapted and for a longer time blocks promotion to the discouragement and disgust of the hundreds of officers who follow him. (Jan. 9, 1904.)

The demoralizing effects of promotion by selection are so apparent to any one who understands military life as scarcely to need mention. It is amazing to army men that any intelligent person should seriously consider such a proposition. (Jan. 30, 1904.)

Our correspondent seems to share an error that is very common, that the career of the soldier is the path to glory. In fact, it is the path of duty, and duty often keeps an officer in the rear . . . . or not on the fighting line. (Oct. 1, 1898.)

A good army depends upon the average efficiency of its entire corps of officers much more than upon shining merit of the few. The greater the average excellence the more numerous also will be the instances of exceptional brilliancy. Cherish then average excellence. (Mar. 31, 1900.)

From other sources:

Nothing so soon undermines the very foundation of efficiency, nothing so soon stifles military ardor, loyalty, pride, and enthusiasm in the profession of arms, nothing so soon blights the esprit de corps of an army as to have the impression abroad amongst officers and men that political, personal, or social influence gives any claim to military preferment or to military reward. (Captain Peter E. Traub, Journal Military Service Institution, "Esprit de Corps.")

These irregularities (special advancements) in which there is excess of favor on one side with denials of justice on another, are the fruits of the influence of popular feeling over a corps . . . . that is entitled at all times to have its interests protected by a uniform, consistent, rigidly just and high-toned code of civil regulations. (Cooper's Naval History, Vol. II, p. 175.)

(b) *Selection ill adapted to republics.* One can understand the existence of military selection in strongly centralized governments where the practice of years has reconciled the masses to the selection of individuals to offices of honor and trust, whether from motives of mere favoritism or from more worthy ones. The system finds its natural home in governments where the people are accustomed to endure, without protest, that sense of injustice involved in the consciousness that they are debarred from preferment. But even in such countries one would be disposed to doubt the wisdom of its application to the military branches of government. Recent history, naval and military alike, gives no encouragement to those who would belittle the influence of the underlying spirit that actuates men, and who would pin their faith upon material power alone.

There is sometimes too ready complaisance with which officials in a republic oblige all comers who apply for favors. Public office is too often a mere episode of life. Its duties are undertaken with full knowledge that they are merely temporary and hence are treated lightly, even humorously, rather than seriously. This lack of firmness is reflected at times in large representative

bodies where punitive statutes for the general welfare are enacted to-day to be inconsistently suspended to-morrow by special legislation for the relief of those who violate them.

As illustrating conditions inherent in republics, that pertain directly to our subject, we may recall that quite recently, in view of the pressure brought to bear by aspirants for position, the President found it necessary to issue an order forbidding the use of influence by army and navy officers in securing assignments.

It must be manifest that promotion by selection would place before officers a temptation incomparably greater than any that exists at present, and that every means to secure advancement would be studied with corresponding intensity. And should self-seekers be threatened by the thunderbolts of genuine Executive wrath, the resulting injustice would cut through the service like a two-edged sword. The conscientious would respect the order, the friendless would fear it, while those having powerful interests at their backs would violate it with every advantage and all impunity. And this not because of Executive connivance or passivity, but because of conditions and engagements from which no chief of a republic can hope to be free.

To place advancement upon the foundation of selection will lead naturally and inevitably to the man seeking the office, and not the office seeking the man. It will lead officers to seek notoriety through newspapers, and other means, and the services of a professional press agent will become a necessary part of the equipment for success.

Human nature unfortunately is weak at best; and life can be kept up to high ideals and noble purposes only by the most favorable environment of example and motive. Impair the healthfulness of official surroundings by opening the way to political and social favor, or to bargain and trade, and more insidiously than water seeping through a defective dam will corruption enter to overwhelm us in the day of flood and stress.

Where the contact between the people and the governing authorities is so direct and easy as in a republic the corrupting influence of selection would spread with rapidity and intensity. The durability of a republic in either peace or war rests first, last, and all the time upon the integrity and self-sacrificing patriotism of its individual members. Nothing so disintegrates loyalty and patriotism as a sense of injustice, even if it be a mistaken one.

To cherish such patriotic spirit and hold the confidence of the people the nation must display exact equality of justice and make manifest purity of motive beyond suspicion.

(c) *Frequent changes of order on the registered list undesirable.* An order of precedence in any body of men who must act together as an organization is an obvious necessity. It is the first means by which confusion is reduced to orderliness; and if we had no other aim than mere mechanical formation and movement, such order of precedence would be necessary in any military group. But there are other aims in abundance in the duties of the service, and their prompt and smooth attainment demands that the recognized order should be *certain and established.* It is this that gives consistency and even the necessary rigidity to the organization and distinguishes it from the jelly-fish condition of a mere association.

In this order each individual becomes familiar with his personal environment, knows his place, and feels at home. He is sharply conscious of, and alert to, a certain polarized condition of authority on the one hand and subordination on the other. As fundamental conditions of efficiency these facts are often overlooked. To introduce any method of advancement that has for its avowed purpose a constant and habitual changing of precedence is a most serious project.

The mere contemplation by the entire body of officers, of the possibility that their juniors of to-day may be their seniors to-morrow, and vice-versa, at once loosens the cohesive forces that give firmness to the corps. The changes when actually accomplished would further weaken the system by putting people in new environments and often with antagonistic sentiments to overcome. It is a wise principle by which we have hitherto been guided that no change be made in the established list save as a distinctly recognized exception based upon inspiring deeds of valor and heroism that find approval in every heart. With established order, as here urged, there is, as we have previously shown, abundant elasticity for safe selection in the assignment of officers to particular duties.

Apart from direct considerations of duty and efficiency, but in no conflict with them, is that peculiar sense of "property" in a place that an individual has occupied without protest or disturbance for a long time. Common law recognizes the principle, and

it is well illustrated in the individual places accorded by common consent to the members of the family circle. So long as an officer has not forfeited right to his old-time place, he should not be forced into an inferior one.

REGULAR ADVANCEMENT SHOULD BE BY SENIORITY TO THE HIGHEST GRADE.

It is probable that the officer's list will be increased in the near future by the authorized establishment of a small number of vice-admirals. Interests will be awakened to control the supply of this grade by selection. It will be urged that the numbers in the grade are so few, and the duties so superior in character, that selection is justified.

We cannot deem either of these grounds, or both combined, sufficiently strong to warrant the displacement of an approved system by one so fraught with possible evil as that under consideration. Throughout the essay we have endeavored to advance propositions and find reasons fundamental and general in character; and if any of these are found valid they apply as strongly to one part of the list as to another.

As a more specific answer to the small number of selections necessary to this grade, we would observe that the peculiar evils inseparable from selection would immediately penetrate down the list into the grade of commander at least. In these upper grades it is far more essential than elsewhere that mutual confidence and harmony should prevail. Moreover, the precedent would be dangerous as constituting the entering wedge by which the system would be all too quickly enlarged.

As to the higher character of the duties, these are very questionable on closer examination. The general service duties of a rear-admiral and of a vice-admiral are but little, if any, different in character. The controlling reasons for establishing the superior grade are to confer the additional dignity that should accompany wider command, and to put our service on an equal footing with foreign navies.

It is difficult to see clearly what requisites may be lacking in any man who has qualified and served satisfactorily as a rear-admiral that should disqualify him for service as a vice-admiral. What distinction could any one reasonably make in establishing examinations or discovering tests for admittance to these two grades?

Why should a rear-admiral of good record, who has proved his capacity by long service, be humiliated at the close of his career by debarment from an open grade ahead of him? By what favor, or by what uncertain reason, will his junior displace him? Is the hard-earned fruitage of long service to be treated as a jest? Can we advocate a measure which, with bold effrontery, informs him that his professional record, the accumulation of years, has suddenly become worthless, and that at the last he is discredited?

We should not be deceived in these matters. Consideration for the honors and dignity due to long years of faithful performance of duty are more vital to the best interests of the service in the long run, than are the uncertain and doubtful results of even the best-intended efforts to find superior merit.

Let us suppose that the appointing authority were granted full power to summarily retire any rear-admiral at pleasure without assigning reasons. Promotion to vice-admiral by seniority could then be maintained by the simple expedient of retiring those considered unworthy of promotion and who stand in the way. Under such conditions how many of these veterans would any one be willing to strike? It is likely that very few would suffer. Their merits would be more readily seen and appreciated from this point of view. Yet, promotion by selection enables the appointing authority to practically accomplish, under the cover of virtue, what it very probably would decline to do openly. Yet, if it is all for the good of the service, why should there be any hesitation?

CONCLUSION.

Occasional phrases in the arguments of those who advocate selection suggest the possibility that divergence of opinion upon the subject may be due largely to the different mental impressions received by individuals when the service is considered as a whole with regard to efficiency. It would seem to be a case of looking at opposite sides of the shield. The selectionists are rather pessimistic. They see the blue side. To their vision the officers appear as a more or less inefficient body with a comparatively small number of energetic, capable men scattered here and there through the mass; and they feel that the only hope of efficiency is to get these conspicuously capable people to the top where their intelligent direction can save the situation. On the other hand, those opposed to selection see in the body of officers a generally

competent set of men, well trained to their profession, the peers, at least, of any possible antagonists. Sprinkled among these, unfortunately, are a few unworthy ones such as are to be found in all professions. These they would like to eliminate for the good of the service.

Correct judgment between these two views would go largely toward indicating the better course to follow for securing efficiency so far as this depends upon the method of promotion. Those who believe the selectionist view of the situation to be a mistaken one, rely not only upon their own vision, which would be illogical, but upon their belief that the selectionist view involves its own contradiction.

If the service is really as defective as selectionists sometimes describe, then selection itself is convicted as a cause. For, although we have promotion by seniority, the personnel of officers is essentially the product of a rigid system of approved selection.

Accepting, then, the more optimistic view as that which more nearly accords with the facts, it will scarcely be contested that it is a much more difficult task to select the exact best man to go up from a body of generally recognized good men, than it is to find the conspicuous black sheep to be eliminated from that same body. Thus, promotion by seniority with elimination of the unworthy would seem to be the more natural and logical method.

The naval service asks only that to which every individual is entitled, whatever his profession or occupation—common justice and a square deal. As regards promotion, we believe that these necessary and desirable ends will be more securely maintained by adhering to the present system. It is believed that a fair review of the paper here presented will show that all the important issues have been considered; that more reasons and much weightier reasons can be given in favor of seniority; and that fewer objections can be charged against seniority than against selection.

As an incidental development of the subject we would emphasize the importance of inculcating in young officers high ideals of duty and patriotism during the initial years of training, in the earnest belief that these are no less vital to enduring success than is professional skill. In this connection the suggestion presses upon us that a regular course of lectures on ethics with special application to military life and illustrated by naval and military history would be most valuable as a minor feature of the Academy course.

Any occasion when promotion by selection is seriously advanced for adoption must be regarded as a critical one. Its advocates, though perhaps weak in numbers, are persistent in purpose, and, like all reformers who are stirred by strong motives, manifest far greater energy than do their opponents. Selection arguments often find ready access to the minds of civil officials of government and there is danger that in some sudden emergency, or peculiar wave of sentiment, this mischievous doctrine may find expression in statute.

The present influx of young officers in large numbers signifies increased difficulty and responsibility in their supervision and training. The naval establishment has become a large and complex system of men and material. Many important questions of organization are yet unsettled. Under these conditions we cannot be too vigilant in guarding the integrity of fundamental principles: principles of fairness and justice that give officers confidence in each other and in the government, and without which there can be no efficiency.

DISCUSSION.

Commander STAUNTON, U. S. Navy.—The essayist's motto is "Look before you leap," and having looked, he finds no necessity for change in the administration of the personnel, but, on the contrary, profound reasons for congratulation in the wisdom, security and efficiency of the present method. Some of his statements appear indeed to involve contradictions. He "concedes willingly that our commanding officers should have the stamina and physical energy of meridian manhood," and on the same page says: "If there is any question it is one of neither physical nor mental incapacity, but purely one of administrative expediency. It may indeed be that the age limits for lieutenant-commander, commander and captain need to be lowered; but, if so, the reason is to accelerate promotion in the lower grades and give opportunity for more experience in the higher ones, and not at all because of declining power due to age."

The essayist does not tell us what he considers the limits of "meridian manhood," but the ages of our captains are from 55 to 61.

Again, on the following page he quotes with approval:

"In fact, *the one objective* worthy of consideration to the lowering of grade ages is that it reduces this preliminary experience" (service in the lower grades).

It is impossible to have more service in the higher grades without reducing that in the lower grades, unless the term of service is prolonged; *i. e.*, unless the retiring age is advanced.

I make these quotations in no carping spirit, but because I do not see their agreement, and do not find in them that continuity of thought to which the importance of the subject is entitled.

I shall not follow the essayist in his discussion separately of the several arguments in favor of selection. To my mind, all arguments for or against any change in naval administration are applicable to only one text—*"The efficiency of the navy for war."* The ambitions and interests of individuals are not worth counting, except in so far as the influence upon them produces results which add to or diminish this efficiency.

What kind of "look" should be taken before deciding as to a change in promotion? What is the character and description of the field that should be surveyed? The question is wholly practical and the field is neither new nor untried. It appears, therefore, that we should study history, examine the experience of others, and gather such lessons and suggestions as are therein contained. The 'inductive" method is the one to employ in this as in similar cases.

Does a nation promote by selection in its navy? Examine its history, and the social, political and military conditions under which its history has been made, the length of time during which selection has obtained, and what has been its apparent influence upon the loyalty, esprit de corps and efficiency of the navy as measured by its achievements in war. Compare this efficiency with that of other navies in which selection has not obtained. Extend the inquiry to armies. These comparisons may not be, and probably will not be, conclusive. Modifications follow differences in racial temperament, in social and political organization. These are fair grounds for examination and deductive reasoning. The field is wide. Great Britain has had selection since the beginning of her organized marine, thoroughly systematized probably for two hundred years. Throughout the upbuilding of her colonial system, the French and Spanish wars, the Napoleonic era, her commanding and flag officers were the product of selection. It has been much modified, and continually for the better. Favoritism and accidental promotion have been substantially eliminated; and Great Britain, the first maritime power of the world, whose national existence depends upon her naval efficiency, still finds that, all considerations included—the stimulus of success and the discouragement of failure—selection adds to the value of her navy.

In the navy of Japan, whose achievements are of yesterday, promotions are made by selection. Russia also, the defeated enemy, has the same system. What causes the difference? Is the selection wise and prudent in one case, based upon merit; vicious and demoralizing in the other, based upon favoritism, or have other causes overwhelmed the influence of administrative method—differences of race, of aptitude, of social environment or national aspirations? This experience is worth examination, and that the Japanese navy has been largely modelled upon that of Great Britain is of import.

There is that in our own naval history which applies: Many of its achievements have been the work of young men. In the war of 1812 all its captains were young. In the war of secession the action of the

Retiring Board of 1855, the resignations of Southern officers and the application of an age retirement in 1861 had the effect of bringing a body of young officers into positions of command, and a large part of the work was done by men who were lieutenants and midshipmen when the war began. There were no fleet actions, and but little fighting with ships, but the wear and tear of four years of blockade were successfully met by the physical vigor of youth.

But this field of experience—of actual fact—is not entered upon by the essayist. He makes passing references to Bonaparte, to Grant, to Farragut and to the Spanish war, but no analysis or examination of the effects of any system. With the exception of a paragraph upon the advaance of numbers for Spanish war service—which is dealt with under the caption of personal reward, and which never had any administrative significance—there is more space devoted to the hypothetical case of Ensign "Bluffy" than to all the experience of the past. The essayist "looks" into his own mind and finds there his arguments for sustaining the position which he has taken. His reasoning is that which is known as "subjective," and the result is only to give us a personal opinion.

Subjective reasoning is a part of the system of logic, and its value within the limits of its proper application is not denied. Even in a purely practical question, like the one under discussion, it bridges our gaps in data, influences the grouping and comparisons of data, diminishes or accentuates inconsistencies and modifies the conclusions drawn. It is the ego of the essay, the play of the individual intelligence upon the material for discussion. But it is not reliable, if exclusively employed. It is not held down to any facts, and the subjective reasoner is at liberty to set forth, and probably does set forth, only such arguments as suit his bias and prejudgment. The inductive reasoner, on the contrary, who examines all the data of experience bearing upon his question, is bound and hampered by it. He may not be free to expand a preconceived opinion. If he is honest with his data—does not juggle it or suppress it—it may lead him to unexpected conclusions. Instances are not infrequent where an investigator has been driven by the results of his investigation to adopt an opinion diametrically opposite to that which he expected to sustain.

I believe that fair arguments from experience would confute many of the essayist's propositions. For example, he appears to find nothing but menace and moral danger in an honorable and gratified ambition. Is this the experience of the world? Isn't selection—the survival of the fittest—the bringing of the best to the top—a law of nature which we find applied in all social, industrial and political organizations? It exists in plants, in animals and in men; in law, in medicine, in art, in commercial life and in the church. Every boy is stimulated and encouraged by his parents and teachers to study and work to honorably excel—to pass his associates in the race—to justify a desirable selection. I find no reason why a navy should be crystallized in a mould and be deprived of the healthy influences of this honorable competition. The burden of proof lies upon him who would take the negative.

I speak, of course, of sound selection, based upon merit and approved service in all the previous grades, and subject only to such limitations and errors as are inseparable from all human judgment, controlled by a board of officers of continuing existence and of responsibility and authority in naval administration, like the sea lords of the admiralty, who in Great Britain make the selections. I agree with the essayist that political and personal pressure may be gravely injurious to the application of selection and may exert an influence so controlling as to render such application inadvisable, but this is a defect of governmental agencies, not of naval selection; and the essayist condemns selection for other reasons before he reaches the question of external influence. Among these reasons I find this: "Surely no one would seek the reward of *advancement that takes money from his comrades.*"

It is a novel proposition that a man selected for his merit, his approved qualifications and his better capacity to fill higher positions and meet greater responsibilities, is guilty of a moral wrong toward his comrade by accepting his advancement. If this were a fact all successful men—governors, bishops and presidents—would rest under this reproach; all great generals and admirals would have this moral taint. But robust and wholesome experience renounces such an opinion as essentially unsound.

The essayist quotes from John Russell Young's "Around the World With General Grant," a remark ascribed by Mr. Young to the General, in which he is made to appear to admire unsuccessful generals. One can hardly say how far any detached quotation represents a man's deliberate and completed opinion, but if it controverts his practice it may be looked upon with suspicion. General Grant, like other victorious commanders-in-chief, selected his generals from among those who had succeeded—not from among those who had failed.

The essayist quotes from a newspaper, as follows: "A good army depends upon the average efficiency of its entire corps of officers, much more than upon the shining merit of the few. The greater the average excellence, the more numerous also will be the instances of exceptional brilliancy. Cherish, then, average excellence."

It would be difficult to find, I think, a sentiment more opposed to the teaching of experience than the one contained in this complacent apotheosis of mediocrity. It is precisely the "shining merit of the few" that is of controlling value, and that nation which places this few at the heads of its fleets and armies has accomplished the most important problem of military administration, and has by that act more than by any other posible act, increased the efficiency and value of its rank and file. It is leaders that are wanted—not men. Men can always be obtained. They are the pawns in the great game of war. Generals and admirals play the game. Sheridan was worth an army corps at Cedar Creek, his invincible purpose and skill snatching victory from defeat. Hannibal in Italy, Wolfe at Quebec, Washington at Trenton—hundreds of instances, irrefutable proof of the superior value of leadership.

Napoleon said: "Les hommes ne sont rien: C'est un homme qui est tout," and history proves it.

Leaders of any grade—military geniuses or merely good admirals and generals—do not develop without opportunity, and the business of peace administration should be to bring forward likely candidates for such distinction; to give a certain number of men such rank and such experience in time of peace that they can enter without embarrassment or novelty upon the duties of a campaign. Early promotion, and the selection which in some form should go with it, are the only means thus far devised for accomplishing this end. The most important duty to the personnel is to train generals and admirals.

The form of selection which the essayist approves as adequate for war necessities is the one of which I most heartily disapprove. That is, the appointment of juniors to command fleets upon the outbreak of war. It may be necessary: if the best men have been stranded by seniority promotion, far below the head of the navy list, it will be necessary; but this necessity is an absolute condemnation of the system thus departed from. An officer who, upon the outbreak of war, is advanced from the rank of captain or commodore to that of rear-admiral, is so advanced because of qualities previously displayed, and might more logically have been advanced before the emergency arose, in which case he would have become assured in his position and accustomed to its duties.

There should be the most intimate relation between the organization and administration of a navy in time of peace and its work in time of war. The one is a preparation for the other: the methods of the one should meet the exigencies of the other. Any opponent of selection in time of peace, who admits that selection may be properly employed in preparation for war, or at any time before actual experience of war has marked the differences between men, forfeits his argument.

Advancements made while the war is in progress, and based upon service in the war, belong in quite another category.

I made, sometime since, a critical examination of our navy list from 1866 to 1905. Without entering into tabulations and explanations, which take up space and time, it is sufficient to say that the result showed the average ages of promotion to commander, captain and rear-admiral under our system to be $51\frac{3}{4}$, $56\frac{7}{8}$ and $60\frac{5}{8}$ years, respectively. They will vary under different circumstances. Expansion will diminish them for the time being, and contraction will increase them, but these figures represent the normal and average ages.

In August, 1904, the ages of British naval captains varied from 33 to 54, the average being 48. The maximum age of reaching the grade of rear-admiral was 55. During the session of Parliament of the previous winter "the First Lord stated that it was the opinion of the Admiralty that captains were reaching flag rank much too old to prove equal to the requirements of the service, thereby imparing the efficiency of the navy; and that in order to obtain younger flag officers a large number of commanders and lieutenants had been advanced by selection to the grade of captain and commander, respectively. Of those advanced to commander, six were under thirty years of age. This affords temporary relief, while Parliament and the Admiralty are considering permanent measures."

German captains in 1904 ranged from 45 to 54 years of age—average 48. Count Reventlow, in the Berlin *Tageblatt* of March 10, 1904, deprecates the age of flag officers, captains and commanders, whom he considers "too old for sea service and to command fleets.".

Japanese captains ranged from 36 to 51 in 1904—average 44.

Summing up, the situation is this:

(1) Promotion by seniority, with only one retiring age, bring officers to command and flag rank much too old for the best efficiency. This is the best naval opinion and is fortified by the practice of the best foreign navies.

(2) These ages can be reduced only by the removal from the active list at different points of a certain number of officers at ages below 62.

(3) Shall selection enter into this removal—selection for advancement or selection for retirement? The best naval opinion, fortified by the practice of the best foreign navies, says that it should, and a considerable body of opinion in our navy favors the German method—selection for retirement and seniority promotion of those who remain—rather than the British method, selection for promotion, and age in grade retirement.

This is the problem that we face today, and I regret that the prize essay of 1906 does nothing to solve it.

Lieutenant RIDLEY MCLEAN, U. S. Navy.—The Board of Control of the Naval Institute, having accorded the prize to the essay on promotion by selection, I am naturally inclined to be timorous in criticizing it; but the fact that the essayist has, I believe, failed adequately to consider certain basic principles and certain axioms of human nature, thus rendering his paper incomplete and its logic unconvincing, lends me assurance in submitting the following discussion for consideration. An apology for the length of this paper is based upon the importance of the subject, and the many points involved on which I differ from the essayist.

I am surprised to find that the prize essay is not so much an essay, as a reply to selectionists. Nor is it indeed a complete reply; it is a discussion of four alleged fundamental principles upon which arguments for selection are said to be based, the development of these fundamental principles being, however, the work of the essayist.

I had, of course, anticipated a complete review of this important subject from the standpoint of its influence upon naval efficiency, its advantages and disadvantages being compared with those found under existing conditions. Instead of this logical treatment, the essayist has refrained from replying to the numerous articles by selectionists which have appeared in the public press, and, instead of attempting to discredit their arguments, he has contended himself with refuting arguments which he alone advances. He assumes, or implies, a method of selection in favor of which he would doubtless find but few, if any, advocates in the entire naval service; he assumes that our naval force is "the peer at least, of possible antagonists" (and by implication entirely satisfactory); he assumes a Utopian condition of human nature under which men will work as hard for the sake of duty as for personal interest; he assumes that increased energy on the part of the personnel does not increase naval efficiency; and, utilizing these

assumptions, he replies so very convincingly to his own interpretations of the arguments in favor of selection as to conclude that promotion by seniority actually lends itself to efficiency, and that promotion by any form of selection would be detrimental thereto. Surely, one may be excused for failure to be convinced by such a line of argument.

Though a majority of officers are so-called "anti-selectionists," I can safely state that, after some years' interest in this subject, I have yet to find a single officer who does not admit that perfectly fair selection would benefit the service; the opposition being based upon the belief that a fair system, devoid of influence, cannot be devised. The essayist has, therefore, left the ranks of the great majority of anti-selectionists, and has proved to his own satisfaction that even the *theory* of promoting officers in accordance with their military efficiency is fallacious. In consideration of this new phase of the question, a different line of argument is necessary. In discussing the views of the great majority of anti-selectionists it has heretofore been necessary to concentrate attention only upon the features of a system which would eliminate the ever present bug-bear of social and political influence; but in considering the views of the essayist it becomes necessary first to demonstrate that fair selection would increase the fighting efficiency of the navy. If it can be proved that promotion based on the merit of the individual will increase our naval efficiency, then the details of the system can and (it would seem) must be devised.

I agree with the essayist that an essential difference between those who oppose and those who favor selection is as to the present military efficiency of the service—the former believing this condition to be satisfactory, while the latter believe that material shortcomings actually exist.

Another material difference of opinion concerns the "inherent personal rights" of officers. Before proceeding further, I therefore wish to state clearly that in no case do I believe that officers have any inherent right to promotion on account of length of service. Even when an officer has served "satisfactorily" and has passed his examinations for promotion, I still believe he has no inherent right to promotion unless he is the best man for the position. The essayist states that "so long as an officer has not forfeited his old-time place, he should not be forced into an inferior one." In my opinion an officer forfeits his "right" to his old-time place, or at least his right to promotion to a higher place, the moment a junior, eligible for promotion to such higher place, demonstrates his superior fitness for the position. The one is a consideration of the rights of the officer, the other, the rights of the naval service. I believe that, in making promotions, the only point that we are justified in considering is the effect of such promotion upon the fighting efficiency of the service. Efficiency of course demands fair competition, which in turn requires that officers have equal opportunities for promotion. Efficiency also demands that, other things being equal, the officer of the greatest length of service receives the first consideration, but this is nevertheless a criterion of efficiency not of personality, not an inherent right due to length of service.

Other fundamental differences are:

Selectionists believe there is a very material difference between men in all walks of life, a difference in ability, in energy, in zeal and therefore

in results; they believe that as much difference exists in the professional ability of officers of any one grade as exists in the intellectual ability of midshipmen of the same graduating class at Annapolis, all of whom have been pronounced "satisfactory"; that efficiency demands that the highest grades should be filled by those of the highest military fitness, and that a possibility of being unable to determine with *exactitude* the relative abilities of eligible officers should not be allowed to interfere with our getting them all near the top, even though they be not in the exact order of their merit; that an increase of energy, intelligently applied, does increase efficiency, almost in direct ratio to the increase of energy; that it is human nature to work harder for yourself than for the sake of duty; that continuous effort is fully incited only by personal interest; that an officer, who is a member of a competing athletic team, will keep his body in better physical condition because of his personal interest in victory, than he will simply because his *duty* demands that he be in the best possible physical condition; that the experience of an officer who has passed successively through each grade and attained command rank at 45, will give him as much "confidence and steadiness of judgment" as he would have gained by ten years' more experience in the lower grades; that the present system of promotion is defective in that, instead of inciting and requiring a higher degree of efficiency, it simply provides for the "elimination of the physically unsound, of those who develop weak character or bad habits, and of the culpably inefficient," as admitted by the essayist.

It is needless to say that if the essayist's hypothesis is correct, that is, if the fighting efficiency of our navy is equal to that of our possible antagonists, and if we should content ourselves with this equality, then selectionists would have no case. Changes are noxious; they are only justified when we are convinced that they will cause improvement. If naval efficiency is satisfactory under the present system, one could not logically advocate a change.

The discussion, therefore, resolves itself into a consideration of the basic principle which was neglected by the essayist. It resolves itself into a yea or nay reply to the question: "Is there any method of promotion by selection which would increase present naval efficiency?"

I am convinced that there is, my conviction being founded upon certain reasons hereinafter stated and compared with the arguments which the essayist himself has attributed to selectionists, but which few of them have ever advanced.

So many words have been put into the mouths of selectionists, and there have been so many misinterpretations of their statements, and even of their motives, that I desire once for all to state what I mean by "selection"; and further, that to ascribe to selectionists certain ludicrous and impracticable forms of promotion is not only an unwarranted reflection upon their intelligence, but so befogs the question as to render many of the arguments not pertinent to the issue. Refutations of forms of selection not falling under the general description given below are therefore totally foreign to the question. I have been among the first

to condemn any form of selection that I have ever heard attacked by an anti-selectionist. I am willing to agree with their conclusions without argument, because they are founded upon a false premise. Without refuting proposed schemes, or discrediting existing schemes of selection, they simply state that fair selection is impossible. Unfortunately the essayist, following the persistent custom of other anti-selectionists, has assumed a form of selection which I, for one, would condemn without an argument, and has then ruthlessly torn it to pieces.

Stated categorically, *"I am convinced that promotion by selection would be more conducive to the efficiency of the naval service than promotion by seniority."*

By promotion by selection I mean a system which would render an officer eligible for promotion to the next higher grade only after an adequate length of service in each grade,[1] a sufficient proportion being sea duty, provided he be chosen solely on account of his meritorious qualities as an officer. Such a system is practicable, and its details have been worked out and published in brief; such a system is in operation abroad. These details are not, however, germane to the present discussion, the object of which is to prove that such a scheme, *if practicable*, would be more conducive to naval efficiency than promotion by seniority.

By promotion by seniority I mean the present form of promotion, whereby each officer who obtains a commission as ensign is promoted in regular order through all grades until he emerges as a retired rear-admiral. This general statement, of course, excepts those who retire for physical disability, or at their own volition, in accordance with laws designed to increase the flow of promotion.

By efficiency of the naval service I mean its *constant readiness for war.* Nothing short of this can be fairly assumed as our goal. It is comprehensive. It embraces personnel, material and administration. It requires the constant readiness of the peace establishment, and a readiness of efficient war-reserves, both personnel and material. In time of peace it requires an administrative system which, on the outbreak of war, can by expansion, not by violent change of system, efficiently assume the increased work thrown upon it. Like an enormous manufacturing plant running at less than its normal output, but ever ready to assume its full rated capacity, it requires skilled and experienced operators always in attendance, both to maintain it always ready for its increased work and to operate efficiently the various units when the extra load is thrown upon it.

Under the above definitions, does promotion by seniority accomplish this? If not, will promotion by selection do so? If neither will do so, which will most nearly accomplish it?

My arguments presuppose that the present state of naval efficiency is not what it might and should be; that we fall far short of readiness for war, though it may be that we are "the peers of certain possible antagonists."

I do not believe that, after many years' trial of promotion by seniority our administrative system is adaptable to war requirements; that the

necessary reserve material is available or that an efficiently trained and properly organized reserve personnel is provided; that we have skillful operators already trained and awaiting the signal for the units of the plant to be placed in operation; that the ships of the squadrons, the squadrons of the fleets, or the fleets of the navy are as well trained as it is possible for them to be; that the science of fleet tactics has as yet advanced beyond its elementary stages (however expert certain units may be in the art of ordinary fleet maneuvers). In brief, I do not believe we are in that state of efficiency which we could reasonably have expected, had increased zeal and energy supplemented the ability of all officers of the service for the past decade, and had the flag officers of the service held their important positions for a sufficient period of time to have permitted them to have carried out a consistent policy looking toward preparation for war.

In what way will promotion by selection rectify the above shortcomings? Herein lie the "fundamental principles" of the main arguments for selection.

1. Selection will provide flag-officers who have eight or ten years to serve.—The advantage of obtaining younger men in the upper grades is merely an incidental to the above, and the essayist's treatment of the subject shows that he has completely overlooked the real purport of the so-called "younger-men" theory. The importance of having the average age of the upper grades three or four years younger has, I think, been exaggerated, and I do not think the importance given this point has come as much from selectionists as from anti-selectionists, who realize the anomalous workings of promotion by seniority, which gives our officers only one or two years' service in flag-rank. I cannot but believe, however, that an officer of 40 or 45 would ordinarily be better fitted for command, had he passed up through all grades (with a definite length of service in each) in the 20 or 25 years since his graduation, than he would be at 52 to 58. I believe this because, while realizing the advantage of experience, I cannot believe that a man who would be competent to command at 55, would not have been better fitted at 45, had he passed successively through each grade. I believe, in other words, that there is a limit to the amount of useful experience one can digest, and that this limit will probably have been reached at the age of 40 or 45. The points wherein a captain of this age would excel one of 55 years would be in a far greater familiarity with the details of his profession, because he would be 10 to 12 years nearer the days when his were detail duties; he would have more initiative; would be less conservative and more open to new ideas, all of which are essential to real improvement of the profession. But economy would prohibit the average age of captains being so small, and besides it is more a question of the *relative ability of individuals* than of *average ages*. Some men of 55 or 60 would in every respect excel others of 40; but a man of 55 or 60, however efficient, would be less efficient as a commanding officer than he himself would have been at 45.

I, therefore, believe that efficiency is more a question of individuality than of age, and while selection would work in the proper direction in

regard to age, this point, instead of being a fundamental principle, is of merely incidental importance. But I do consider that an *increase in the length of flag-officers' service* is a fundamental and irrefutable argument for selection.

In order to explain clearly why admirals of considerable length of service in the flag grades are necessary to preparedness for war, we may regard war in the light of a game of skill.

When we are to shoot for the Palma Trophy, 15 or 20 men are selected from among a large number of America's most expert riflemen, they practice for weeks under the conditions governing the match, and the final team is selected from those who evince the greatest skill under these conditions. The same applies to the somewhat more applicable game of chess, where each member of the team must defeat his opponent by superior tactics, by his superior knowledge of the game, by his ability to recognize and attack vulnerable points in the enemy without exposing weak points in his own lines. The team of already skilled players would be kept in constant practice at the game they were to play during the match—not at some other game.

Or, taking the even more similar "war game," suppose we should accept a challenge from the British Navy to play such a game, not upon a specified date, but on ten days' notice, at any time subsequent to, say, January 1, 1907. What would probably happen? A team-captain bearing the entire responsibility of preparation, would be appointed. Every officer who was known by his service reputation to be fairly skillful at the game would be assembled at the War College, where practice would be incessant. The war-game outfits on board ships would be broken out and placed in operation. As men of exceptional skill developed they would be ordered to the War College to compete. A team composed of those officers *believed* to be the most skillful would be selected, and would be in all respects ready for the contest by January 1st, and thereafter, while awaiting the signal, they would be kept in daily training by contests with each other under the prescribed conditions of the match. All of these preparations would be made simply for the pleasure of seeing in large headlines "American Fleet Wins Glorious Victory."

Now the challenge to play the actual game of war, using real ships and guns, will come like the above—except that there may be even less warning; we do not know that it will be postponed until January 1st. When it is a matter of handling dummy ships, any capable officer can compete for the team and train himself to expertness on the tactical board, but in case of actual war, naval organization demands that the team that is to play the game and handle the fleets and squadrons be composed of flag-officers, and as they can attain skill in their duties only by experience in these duties, they should, when war breaks out, have been flag-officers long enough to have attained skill *in the duties they must perform during war*, not in subordinate duties.

Note the preparations for a contest in which only a cup is at stake. Are any such preparations made for the game in which life, treasure and national honor are at stake? We have many officers of flag rank,

but have we a team of admirals, *skilled and experienced in the duties of their grade afloat, who would be available for command in time of war?* Manifestly not! On January 1st, 1906, the average age of rear-admirals was 61 years, which is also almost exactly the average age of the six juniors. It is apparent that when this grade is reached only a year before retirement, the experience gained in the duties of a flag-officer afloat is practically nil, and even if reached somewhat earlier, and proportional experience be gained, of what benefit is this experience to the service when the officer is immediately placed on the retired list. Some may say that these officers are experienced by service in lower grades. Without underrating such experience, we may confidently assert that experience in the duties of his grade is as necessary to a flag-officer as to a gunnery officer, a chess player or a player of the war-game. Not to admit this is to belittle the duties of flag-rank. Here then is a game with the greatest of all stakes, a game liable to be called at any instant, for which the automatic working of our system of promotion by seniority must *always render us unprepared* by reason of the lack of a number of commanders skilled and experienced in the vitally essential duties which they will be called upon to perform in war.

I believe the above is a sufficient reason in itself to demand an abandonment of promotion by seniority. In other words, I believe that the ordinary preparation for any contest, however trivial, would require a team of men *always in readiness* who were *already trained* in the duties they would perform in the contest. This is true even if the team were composed of men of only average ability, but, in view of the tremendous importance of the game they are to play, it is manifestly essential that this team of flag-officers be better than the average.

2. This brings us to another fundamental principle of selection, which the essayist states as follows: "Selection is desirable in order that those having higher professional qualifications may occupy the places involving greater responsibility." This I consider a "fundamental principle," but I believe it to be incorrectly stated and illogically argued. I believe, moreover, that the argument is tainted throughout by the essayist's belief in the "inherent right of officers," rather than by a consideration of whether naval efficiency would be improved. The essayist considers it entirely satisfactory to have our higher grades composed of average graduates of Annapolis who, after forty years' service, during which there is no active incentive to attain excellence, have not developed "bad habits, bad health, or been found *culpably* inefficient." He asks how could we determine the positions of the greatest responsibility, or determine *with exactitude* the qualification of officers. In other words, he enunciates the "principle" as he himself understands it, proves that it cannot be followed with *exactitude*, and therefore concludes that he has disposed of that question. In his quandary as to the exact positions of greatest responsibility, and as to whether the relative qualifications of officers could be *exactly* determined, he appears entirely to lose sight of the question as to whether the *efficiency of the service* would be improved if *all of the men* filling all of the positions of responsibility were

better than the average, even though they were not in perfect order of merit. In other words, the controlling idea of the "inherent rights of officers," whereby no change whatever is allowable unless each officer gets the exact niche to which his merits entitle him, has been permitted entirely to obscure the fundamental question as to whether naval efficiency would be improved. I cannot believe the essayist is serious in his doubts as to the positions of greatest responsibility in the naval service, but to avoid misconception of this point, I would enunciate the principle thus: "Selection is desirable in order that the higher grades of the navy may be composed of officers of more than the average ability and energy."

The essayist admits a difference in ability between officers. Seniority must necessarily give us average officers in each grade; and, to quote from "The Letters of a Self-Made Merchant to His Son": "You can't run a business on the law of averages and have more than an average business"—and an average navy must necessarily be defeated by an expert one.

I deny that any officer has any rights which should be allowed to interfere with our naval efficiency. If by any just means we can get the upper grades filled by men of more than the average capabilities, the efficiency of the service will be increased. Even though the very best man in a class *may* fail to go up more rapidly than any other member of the class, we can be sure that he will go up, and that he won't be far behind his more fortunate inferior. We may feel sure that the men who go up ahead of him are good men; and that the navy is benefited by having these men in the upper grades, even though they may not be in exact order of merit. The impossibility of attaining perfection in grading is, of course, admitted; also the impossibility of attaining perfection in other things; but perfection in grading, however desirable, is not our aim—it is the *improvement of naval efficiency* which we seek, and as this will manifestly be accomplished by utilizing our best abilities in the upper grades, it is a strong argument for fair selection.

It is true in one sense, but a play on words in another, to say that it is impossible to determine the good men in each grade; that one man is good at one thing and another at another. Again the trouble is the fear of wronging some individual. In each grade certain officers are known to the service for their efficiency, and on each ship the ability of officers is well known. If every captain and executive with whom an officer has served in his present grade certify on oath that if ten officers were to be selected from the grade, they would include him in the ten, we may feel sure that he is a good man, and though he may not be the very best, he is so near the best that he can be promoted with the certainty of his being a man far above the average. And just here I would point out another fallacy in the essayist's line of argument. He apparently assumes that the entire object of our desire to get good men on top is that officers may be chosen in the emergency of war *in their order of standing on the navy list.* The assumption is not flattering to the intelligence of selectionists, to say the least. It matters little where officers stand on the list of their grade, when they are wanted for certain duty,

but one thing we *do* want, and that is *to get the best men into the higher grades*, so that they may have been trained in the duties of high command, and hence be available to be assigned to responsible duty immediately upon an outbreak of war. It is true that in time of war the President has authority to appoint any officer of the rank of commander or above to the command of a division of a squadron, but would it be desirable to assign a commander to flag duty, considering the fact that such an officer would be without previous training and experience in the position?

Another requirement of no less importance than the above, but one which the essayist completely loses sight of, relates only to peace. During time of peace we need the best men in the upper grades in order that they may efficiently *prepare us for war*. However good may be the leaders which the essayist would choose after war broke out, unless efficient preparations have been made during peace we must lose. When average officers compose the upper grades during the ten years prior to war you will have preparations of average efficiency. This cannot be denied. There are good, energetic and progressive officers among those of average ability, and they wil make their influence felt, but so will the less efficient. In war it is possible to select good men for specially important positions, though they cannot have had much training in their duties; in peace the less efficient officers of high rank must necessarily occupy positions of influence and responsibility, and the amount by which their services are less efficient than would be that of the best officers cannot be measured, but it exists nevertheless.

For the above reasons, I believe no one can successfully contradict that efficiency would be increased:

(1). If flag-officers served eight or ten years.

(2). If the higher grades of the navy were composed of officers of more than average ability.

Promotion by selection will accomplish this. Can it be accomplished by promotion by seniority? Manifestly not. By its very nature, promotion by seniority requires that each grade be composed of officers of all degrees of ability. It is futile to talk of "boards of officers of high character, of patriotism, of courage, having pronounced them physically, mentally and morally fit for these places." As the essayist, as well as every other person, admits a wide difference in professional ability, why theorize about the effect of promotion by seniority? Why say "Let courts-martial, examining and retiring boards do their duty with vigor"? We have with us the actual workings of seniority, and such words as the above are idle exclamations. We all know that of officers who maintain only reasonably good health, at least 99 per cent of those who are commissioned as ensigns are promoted from grade to grade until they are 62, unless they voluntarily retire or resign. We all know that in practice a board, however conscientious, *must* promote unless it can *prove* incompetence in a manner which would hold before reviewing authorities, in much the same manner that a verdict of a court-martial must be sustained. We know that when an officer goes before a board he must either be

promoted or dropped, and that in consequence, it is but human nature, in all cases of doubtful fitness, for the board to give the benefit of the doubt to the *officer* instead of to the *navy*—thereby risking disaster to the navy if any of these officers, having arrived near the head of the navy, happen to be in command of a fleet at the outbreak of war.

The fault is not, as the essayist implies, in the manner in which the boards do their duty, but in the system—a system which, while meting out punishment for bad habits and overt violations of discipline, offers positively no incentive to acquire efficiency in excess of the amount required not to be unsatisfactory, because we all know that a merely perfunctory performance of duty is never alone a cause of failure to promote. When, after years of trial, a system does not work as designed, when it is necessary for its advocates even then to say "Let them do their duty and all will be right," we may be sure that it is the system, not the board or the individual, which is at fault. Hence it is certain that promotion by seniority will always give us in the upper grades officers of only average ability, including the best officers, along with those whose unfitness for responsible command in war cannot quite be proved by a board.

Can it ever give us officers in flag-rank with eight or ten years to serve? Again, manifestly not. If officers of flag-rank from only 2 per cent of officers of the active list, the most elementary mathematics will show that their term of service must necessarily be short. How then can the necessary length of service in flag grades be secured? By age-in-grade retirement, or by selecting out? We of the navy know little of economy, but we know that it would not be economical to propose to retire every officer at 53 or 54 who fails to attain flag-rank by that age. It is not, moreover, illogical to have a man's promotion to a higher position depend entirely upon his age, upon the age at which he entered Annapolis rather than upon his ability? In regard to "selecting out," that system removes the most inefficient and hence raises the average somewhat, but still does not give us the ablest officers in the positions of greatest responsibility. If such a large percentage of officers were selected out of the upper grades exclusively as to leave only the ablest men, and if the men so selected out were placed on a reserve list, and their services still utilized, it would accomplish many of the results claimed for selection, but it would fail to exert on the lower grades the necessary incentive to secure efficiency in training. Hence, for the above reasons, I believe "selection up" to be the logically sound method and the only one which will insure the highest efficiency in war and in preparing for war, while the various forms of "selection out" are more or less efficient compromises which have been proposed for reasons of expediency.

3. As the essayist states, one of the fundamental principles upon which selectionists base their argument is that "selection is desirable because it would stimulate energy throughout the service and thereby promote efficiency"; but, as I cannot accept the attempt he has made to discredit this principle by ascribing to human motives an influence that is diametrically opposed to what I have always understood this influence to be, I am impelled formally to prove what I have always regarded as axioms.

(1) I believe that the vast majority of men will work harder for themselves than for duty's sake. As a fair proof of this I may cite the increased work and energy in all grades concerned with gunnery training, since it was placed on a basis of fair competition; since the time when pointers and division officers, ships and squadrons, began to be compared with each other. Was it an increased sense of duty which caused this change, which caused officers and men cheerfully to spend hours at daily training? No, it was the personal desire to attain a higher standing and a reputation for ability. Regulations pointing out that it was their duty to train their crews to as high a degree of efficiency as practicable had long since been in force, but the improvement, the result of increased intelligent work, was coincident with the regulation which placed the divisions, ships and squadrons in competition. In other words, it was the direct *personal motive,* not the call of duty which had the effect.

The spirit of competition is one of the most powerful forces acting upon human nature. It is the natural personal desire to win. To attain the greatest result in ordinary life, one must have an ever present personal incentive. We daily introduce local incentives; for example, those which increase excellence in gunnery, in small arms, in boat racing, but does not the very success of this incentive applied locally, demonstrate the necessity of a more general application of the principle—one which will incite all officers to exert at all times their best energies in *whatever duty they may have to perform?*

(2) I differ diametrically from the essayist in his statement that "Increased energy does not spell increased efficiency," when applied to naval conditions. An increase of misdirected energy might fail to increase efficiency, but it surely begs the question to assume that all increase of energy on the part of naval officers would be misdirected. Would not the exertion of the best energies of each officer be more productive of naval efficiency than the exertion of the energies incited by the average sense of duty?? Was improvement in gunnery not due to increased energy? Is the remarkable difference in the efficiency of ships not due largely to a difference in energy, incited usually by some stimulant such as ship spirit? Does the essayist believe that the results accomplished by an officer who is noted for his zeal and energy, are no better than those accomplished by the barely satisfactory officer? Does he believe their divisions will be equally efficient? Which of these not uncommon types would he prefer on a ship which he commanded? One who will not admit that an increase of energy applied to all routine duties would not produce increased efficiency, appears to me to be unfamiliar with human nature. Increased energy may not spell increased *ability,* but it does spell increased *efficiency;* especially under naval conditions. Surely every step that increases the energy put into our daily labors must increase the result therefrom; and examples abound which show that personal incentive is the means by which the greatest possible energy can be infused into human beings.

(3) Now as to the theory of "ruining" good officers by placing their juniors ahead of them. With concrete examples in existence, it is hardly

necessary to resort to theories. Does it ruin a good student to see others advance above him? How many officers have been ruined in our own service by being "jumped"; are foreign officers ruined by this process? Is the trophy ship or the crack turret or division ruined by losing the leading position? No, the theory requires modification. The efficiency of *some officers would be decreased* if other officers were *promoted over their heads for other than reasons of superior professional fitness.* But I cannot believe that zeal would be diminished if, in a competition, open to all and acknowledged by all to be fair, some one went over their heads. It is not borne out by existing examples, nor is it logical to suppose that it would act thus. It is an unsupported theory that is frequently advanced in the face of proof to the contrary. A man defeated in *fair competition* redoubles his efforts, and this is especially true if he feels that he is the better man and that "bad luck" caused his defeat, for of course there is a certain element of chance in all competition. Especially is an intelligent man not going to lose interest when the moment he loses in one competition he finds himself entered in another. By doing so he loses forever his chances of attaining higher rank. In fact, I cannot see how any man whose qualities are such as to render him desirable in the upper grades, or in fact, who would be useful in any grade, would by any form of reasonably fair selection, based on proficiency, lose interest or suffer any decrease in efficiency.

Concerning the essayist's assumption that one of the "fundamental principles" of those who advocate promotion for merit is that: "It is desirable as supplying reward to deserving officers," I would state that I have never heard this suggested as an argument, except in so far as it bound up in the feature of stimulating energy. It has been pointed out how a knowledge that an officer's promotion depends largely upon his personal efforts would stimulate energy, develop ability and hence increase naval efficiency, which is our sole aim; but to urge promotion as a reward, pure and simple, aside from its stimulating effect, reverts to and depends upon the theory of the personal rights of officers, a theory cherished chiefly by anti-selectionists. Therefore the pages devoted to this subject are not pertinent.

Referring to the essayist's "comparison of civil and military conditions," wherein he suggests that high business positions are frequently filled by men selected for other reasons than their ability, it will be noted that in no case have I based an argument on business organization. The essayist's point is, however, poorly taken, since to use this as an argument against selection it would be necessary for him to demonstrate the efficiency of filling the high position in a business with incompetent relatives or friends.

Replying briefly to the essayist's objections to promotion by selection:

(*a*) "Corrupting and disintergrating effects of personal, social and political influences." Any satisfactory system of selection must necessarily reduce these to a minimum. As I have stated, my arguments are all based upon the assumption that these influences *can* be practically eliminated (as in the British navy), so much so as to destroy the force of this argument, otherwise I am opposed to selection, for all must agree that if

promotions were determined even considerably by political or social influence, it would result in developing proficiency in social amenities, rather than in professional duties. But so long as the officers are *convinced* that the method employed would eventually insure the promotion of *all* of the best men to the highest grades, and would render it impossible that *any* indifferent man could be promoted successively through all grades, that is, so that the main object of selection is accomplished, it is illogical to cast aside this benefit to efficiency, simply because we do not attain perfection in eliminating absolutely all of these influences.

It will be observed that the esayist assumes that naval officers will always be actuated by the highest sense of patriotic devotion to duty, except when serving on a selection board, when, for some unexplained reason, they will be influenced by the most ignoble motives. Can selectionists not expect their boards to possess as "high character, patriotism and courage" as the members of the loyal examining boards described by the essayist?

(*b*) "Selection ill-adapted to republics."—I believe I have shown logically that fair selection would increase naval efficiency. If this is true for one navy it is for another, and therefore I cannot see the force of the above statement. It might truthfully read: "Republics are ill-adapted to own navies." But as we are a republic, and as we own a navy, and as we may be obliged to fight, it would seem that if selection will improve our efficiency we need it all the more.

(*c*) "Frequent changes of order on the registered list undesirable." I cannot take this objection seriously. If naval efficiency needs to be increased, is the mere fact of the undesirability or inconvenience of a detail of this nature to be considered? Because individual places are "accorded by common consent to the members of a family circle," are we to accord to every individual in a fighting organization a place for life, regardless of his prowess. In savage warfare the leaders are selected solely because they are the most skilled in that style of warfare. Because our standards are more complex must we definitely abandon this sound principle and adopt the family circle as our criterion?

In conclusion, I beg that words be not put in my mouth. I do not advocate that "Ensign Bluffy" be promoted for falling over a bucket of water at an opportune moment. I do not advocate promoting ensigns or lieutenants directly to flag rank. I do not advocate a system which will advance any man who has not had adequate experience; but I do advocate selection for promotion to the next higher grade from the upper half of the list of lieutenants, lieutenant-commanders and commanders, said selection to be based upon the military efficiency of the officer selected, *as certified to*, not by a board of high rank at Washington, *but by the large number of officers with whom he has served.* Such a form of selection would result in the benefits above pointed out, and will be conceded by the large majority of anti-selectionists as being correct in theory, but they will unite in saying that it "cannot be accomplished." To such officers I would point out that they have no right to say "can't." I believe it can, and the Naval Institute has published one such system which has not

been attacked; the French and British have such a system; but regardless of whether the particular ones would work succesfully or not; if selection is necesary, if it will increase naval efficiency, have we any right to say "can't"? If officers believe in the theory, believe that naval efficiency would be increased by a fair form of promotion, based on professional fitness, is it not too serious a matter to be calmly dismissed with a "can't"? On the contrary, is it not our *duty* to expend every energy, and leave no stone unturned to *find* a practicable method whereby it *can* be successfully accomplished?

Commander BRADLEY A. FISKE, U. S. Navy.—Everybody knows that, in any organization, the amount of success achieved is the direct result of the character and abilities of the men composing it. This applies to all the men, but more to those in high positions than to those in low positions. Therefore, in any organization, in order to achieve the greatest success, the most important thing is to get the best men in the high positions. Not only is it more important than any other thing, but it is more important than all the other things put together; because the other things follow directly from it. In a navy, at the present day, such complete preparation must be made in time of peace that everything shall be ready when war comes. Therefore the ideal towards which we should strive is to get the best men in the high positions, and to get them there in time of peace. The fact that a satisfactory plan for accomplishing this has not yet been devised has nothing to do with the case. The fact that a very desirable thing is hard to accomplish is not a reason against trying—but the reverse.

Doubtless this discussion will bring out the views of many officers. After this has been done, I beg leave to suggest the appointment of a board—composed of officers of various grades—to consider and report upon the subject; and that officers of the navy be invited to submit their views to this board, and propose schemes for accomplishing *fair* promotion by selection. The conclusions of this board, after, say, six months of work, would have overwhelming weight with the service, and with Congress and the people.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

SECOND HONORABLE MENTION.

GLEANINGS FROM THE SEA OF JAPAN.

Was the result to be expected?
Could the result have been different?
What lessons have been told and what new vistas opened?

By CAPTAIN SEATON SCHROEDER, U. S. N.

Motto: "Fire answers fire; and through their paly flames
Each battle sees the other's umbered face."
Henry V, Act IV, Chorus.

When the forces of nature, according to their guidance and direction, are so potent for good or for ill as is the case on the seas, but a small margin of superiority will often suffice to turn the scale from complete victory to overwhelming disaster. On the memorable 28th day of May in the Strait of Tsushima, where physical and moral forces had full play, the tragedy enacted was, in its mode of enactment, in its swiftness, and in its ultimate completeness, certainly without a parallel in military history. Man's annihilation of man and of his works had not before been achieved in a manner comparable to that of the battle of the Japan Sea. Admiral Rojestvenski's fate was decided within an hour and the victory accomplished within three hours, after which it was only a question as to how completely the remnants of his force could be overtaken and destroyed.

I.

A question is natural: With the knowledge possessed or thought to be possessed at the time, being so completely overmatched, could the Russian fleet have entertained the faintest hope of success? Could on-lookers have for a moment thought any other issue possible?

There was a general impression from the time that the Baltic fleet started on its long voyage, that in the impending naval operations the advantage would lie greatly with the Japanese. As an offset to the simple and well-known fact that the Russian fleet comprised more battleships than the Japanese, there was generally cited (and very correctly, within bounds) the experienced veteran personnel of the latter, hardened, trained, and steadied by their service and participation in previous actions; also their immense preponderance in torpedo-boats and destroyers. There were also other factors less generally commented upon though of equal importance to influence the situation.

It is not necessary to quote the well-known relative strengths of the two fleets in ships; in the matter of heavy guns, however, the situation is less well understood, and it should be pointed out that Admiral Rojestvenski had the superiority in calibers above 8-inch, but that if that very efficient caliber were considered, the advantage in number of heavy guns lay with Admiral Togo. On the other hand, the value of the Japanese heavy batteries was modified to some extent by the circumstance that three of their 12.5-inch and four 10-inch and four 8-inch were mounted in unarmored cruisers of 4000 to 5000 tons, not usually considered competent to stand up in the line of battle. This is all under the supposition that both sides would have all their ships present; on both sides were some that the respective commanders might decide to leave out of the battle-line, and some also might not effect a junction, for instance, the *Gromoboi* and *Rossia* at Vladivostok.

The disparity in torpedo craft was very great and created a situation which must have given the Russian commander fully as much concern as any other one factor, especially as it imposed the necessity of a vigilance, alertness, and tension which lasted from before entering the Sumatra Strait until the day that battle was joined.

It is true that the experience of the war thus far tended to assign a diminished value to the torpedo. In illustration of this it is pertinent to recall the curtain-raising attack upon the unsuspecting Russian fleet off Port Arthur on the night of February 8, 1904. The Japanese boats approaching at midnight were mistaken for the Russian flotilla which was expected, and were allowed to approach without misgiving, the people of the Russian

fleet apparently having no knowledge of the imminence of war; from close range they discharged their torpedoes at the nearest vessels as they passed and escaped to sea without injury. It was not until the officers of the *Pallada* actually saw the bubbles of three torpedoes speeding by that they realized the situation and went to quarters; and when they finally opened fire, the flagship signalled: "At what are you firing?" Under these exceptional circumstances, creating a condition tantamount to simple target practice at short range and in smooth water, it appears that at least 24 torpedoes were discharged, of which three took effect. On the other hand, it is to be remarked that two battleships, each struck once, had to be beached and afterwards docked; and beaching would be out of the question for Rojestvenski's ships except upon a hostile or at least a neutral coast.

Again on June 23, 1904, after the battle of that day and the return of the Port Arthur fleet, the Japanese flotillas commenced individual attacks after dark, making ten attacks in all; not one hit was scored although the fleet was at anchor. A notable and possibly significant fact transpired in connection with this occasion; in the morning after, twelve torpedoes were picked up having run all the pressure out of the flasks and not being set to sink. No doubt many others must have been carried away by the currents which run strong along there, and it tells a tale therefore of the number that were discharged during that soul-stirring night. But of still greater significance was the fact of these torpedoes being existent, that is not exploded; it is manifestly impossible that they should have been set to run just through the anchored fleet and then stop, for it was out of the question to get the distance; moreover, all the pressure was out of the flasks; they must have finally struck and been stopped by the shore (if not in some instances by the ships), and with so bold and rocky a coast they should have detonated. Is it possible that their safety appliances functioned poorly or were neglected when loading the tubes? If so, small comfort could be gleaned from this remarkable failure, for the most optimistic could not hope for a continuance of immunity from such a cause.

Despite this poor showing it cannot be denied that the number of the Japanese torpedo-boats constituted a most formidable element to be reckoned with. The circumstances promised to be materially different from those off Port Arthur. It was to be

supposed that the crews of those small craft, smarting under censure and lack of success, would be not merely nerved to make the most heroic sacrifices (for that they seemed ever ready to do), but would have their weapons and accessories in perfect condition and not paralysed by failure to remove safety appliances or whatever was the trouble. Furthermore, it was on the cards that night attacks might be made incessantly, and, the fleet being on the open sea and assailable from every quarter instead of only from seaward, as when off Port Arthur, it seemed most probable that one or two torpedoes might reach home and annul the advantage in ships before the fleets should come together. Or after a day's battle, which might be indecisive, with secondary batteries and search-lights swept away, the big ships would be comparatively easy prey; the Russians had no serious torpedo-boat defense.

One of the greatest advantages possessed by the Japanese fleet was in its proximity to its fortified ports and dockyards, where a vessel injured in battle or otherwise could find refuge and be repaired. It was evident that any Russian ship badly hurt would be most unfortunately situated. In the event of a different outcome of the first day's battle, the remaining ships of the defeated fleet could have been rushed to port and saved, and although the enemy would have won a victory and gained the important point of reaching Vladivostok, still the defeat would not have become an overwhelming disaster; there would still have been a fleet in being, and command of the sea would still have been a problem. It was certainly patent that any Russian ship which might touch a reef or be touched by a torpedo would be of little farther value for the fight which must occur before reaching Vladivostok, and would probably have to be abandoned or sunk (or interned) to forestall eventual capture. Of the various elements of prime importance—the size of the fleets, the difference in their speeds, the possible difference in the quality of their materiel, the possible difference in the skill and morale of their personnel, and the proximity to or exclusion from repair yards—the last named may perhaps have been regarded as of the least weight in balancing the chances; and, as the event proved, it was actually of no influence in deciding the tide of battle; but that was not known and was hardly to be expected beforehand. In the opinion of the writer such relative assignment at the time was in error; if circumstances had permitted torpedo attacks previous to the battle,

very likely Rojestvenski's peculiar situation in that regard would have compelled him to accept battle after suffering serious losses which the availability of a dockyard would have annulled in a few days; and in any event the possession of a harbor would have given a different coloring to incipient sparring for position. Looking at it in another light, a fleet repairing and resting comfortably in its own home ports, undisturbed by possibilities of night attack, had a vast advantage over one steaming 15,000 miles to engage in a fight immediately upon the completion of the voyage.

The efficiency of the individual ships of the two fleets, simply on the basis of the materiel, was somewhat a matter of speculation and intuitive conception. There is perhaps no fleet regarding which details have been kept from public gaze with such success as by the two in point. A newly created sea power, with little or no obsolete material, and, what is more important, with no obsolescent practices and theories to overcome, is apt, other things being equal, to forge ahead; and when the development of the new toy is attended by the enthusiasm accompanying the thoughts and hopes of a "revanche," an older and less actively stimulated service may well be distanced. The Russian Port Arthur fleet is understood to have been without telescope-sights, and it seems to be an uncontradicted fact that one of the battleships of that force fired its 12-inch guns for the first time in the battle of August 10. Did the Baltic fleet have proper sights on the guns? Was its powder of uniform action when manufactured, and did it remain so after so many months steaming at sea? In the construction of the ships, had the lessons of the Yalu and of Santiago been heeded and unnecessary woodwork eliminated from the hulls? The answer to this last question could supposedly be affirmative, for the reason that in the previous engagements of the war no serious instance of fire appears to have occurred. It is true that that immunity was possibly due as much to the failure of fire communication by the enemy's explosive as to the absence of combustible material in the structure and fittings of the ships attacked; but the ultimate result would be the same, as there was no good reason to suppose that the Japanese would (or could) have changed the character of their bursting charges. The Russian Navy Department having become thoroughly aroused, it was fair to assume that the ships were well gunned and equipped, as

it was also fair to assume that in their original design and construction they embodied details abreast of modern naval progress. There had been nothing in previous operations to suggest imperfection of armor or of any other element excepting the lack of telescope-sights and possibly defective loading arrangements resulting in slowness of fire.

In the matter of speed there was suggestion of serious difference. Fifty years ago a fleet could remain at sea for years without finding its speed reduced by foul bottoms. But things are different now. Although two of Rojestvenski's battleships were sheathed, and although reports (less or more credible) were current that by means of the divers and of scraping appliances he had kept the other bottoms fairly clean, it was an acceptable hypothesis that the general speed of his fleet was materially less than Togo's. The three Russian coast-defense ships had been recently re-engined and re-boilered (as well as re-armed); but the speed of a small and low-freeboard ship can never be relied upon to equal on the high seas a normal performance of a high-freeboard ship, and those three vessels therefore promised to be something of a handicap if put in the line of battle. The speed of a fleet being no greater than that of its lowest unit, an undoubted advantage was to be reckoned with as possessed by the Japanese. The extent and the value of this advantage are perhaps both open to some differences of opinion; in certain conceivable cases its value may not be gauged in the same way nor by the same standards as would govern in determining a general programme of construction for all-round service. Certain strategic advantages which might spring from a superiority in speed in the initial maneuvers of hostile fleets could be materially diminished by the possession of equal speed by a portion of the slower fleet, provided the liberty of action of that slower fleet were not restricted by restriction of the battle theater nor compromised by considerations of battle efficiency or other material or moral factors. On August 10, 1904, the speed of the Russian fleet was that of the *Sevastopol*, which is understood to have been very much reduced, and the Japanese could have fought the action at short range if they had so desired; but they naturally selected long range as a rule, having more heavy guns and telescope sights, and the Russians apparently made no attempt to close—except the *Retvisan*. There was reason to believe that Admiral Rojestvenski would be so

situated in the matter of guns, sights, and possibly even gun-pointers as to be indifferent about the range, presuming the efficiency of the Japanese in those respects to be the same as on August 10. Take it all in all, the situation in the matter of relative speeds must have been considered as being favorable to the Japanese though not to an extent so overwhelming as might appear from a casual comparison of figures.

Not the least interesting element of efficiency requiring consideration is "the man behind the gun," which man includes very specifically the division officers who learn the range and communicate it in proper terms to the sight-setters, solve local problems of ammunition supply, control the fire, and are ready to meet all emergencies in engine room, magazine, and turret. The known conditions existing before, during, and after the battle of August 10 quickly pointed to a markedly less difference, if not an actual reversal, in the previously supposed relative efficiency of that "man behind the gun" of the two fleets. The fact undeniably and inexorably exists that the Russian fleet acknowledged itself vanquished and returned to port and subsequent annihilation; but a pregnant fact, big with significance in the present study, is that at the time that, by the death of Admiral Witgeft and the temporary disabling of his flagship, the supreme command devolved upon the next in rank, victory was in his grasp. The exact circumstances of that fatal retreat are not yet clear. Prince Ukhtomshi was in another ship and could not know just what had befallen the *Tsarevitch;* it is not certain that he signalled to return to Port Arthur, and if his signal was simply to follow him it appears that it was believed, rightly or wrongly, that the intention was to fall back, though the gallant work of the *Retvisan* was illustrative of what could be expected of individual ships. Whether or not the fault lay with the commander-in-chief for permitting, or not preventing, an unnecessary retreat, the Russian fleet was, at that crucial moment, in a condition and position to at least succeed in the object of the sortie, viz. to make Vladivostok.

None were more surprised than the Russians on that day to find that they were not pressed in their retreat. Why was this? It was a matter of common note that the Japanese fire was much the more rapid, the estimates varying between two and three shots to the Russians one; as a direct result of this the Japanese

must have been in danger of running short of ammunition if the fight were prolonged, while the Russians must have been sure of a considerable supply. But this situation was not enough of itself to explain such complete letting go. Admirers of Admiral Togo, among whom must be counted all who can read or hear, find a reasonable explanation in the wonderful self-possession of that remarkable man who realized that every greatest benefit would be reaped by allowing the enemy's ships to return intact to the harbor where they were doomed to be captured. Great indeed, and reckless, would have been such prescience and forbearance. But the supposition is at variance with the fact that the torpedo flotillas were ordered to the attack and did attack gallantly though without avail, for which it is said that they received a caustic rap. No; there were other reasons, which must be sought in the vague rumors of damages inflicted partly by the enemy's fire and partly by other agencies, injuries of no small moment having apparently been received through misfeasance of their own ordnance material. Nothing definite can be stated regarding this; Japanese dockyards are closed to outsiders, and Japanese workmen, newspapers, and general public are loyally reticent to a point apparently not conceived in other countries. On the other hand, in spite of the Japanese superiority in heavy guns and of the rapidity of their fire and of their guns having telescope-sights, serious damage does not appear to have been inflicted upon any Russian ship except by one shot in the *Retvisan*, although for some time the huddled fleet in confusion was an ideal target for the converging fire of the Japanese circle. The *Tsarevitch*, whose gun protection was practically similar to that of four of Rojestvenski's ships, after steering for some time from the berth deck, managed to repair her steering gear and made a neutral port; she has been described by our own and foreign officers who saw her afterwards at Kiau Chau as practically uninjured in any vital part, with her guns intact, and after repairing smokestacks able to make 16 knots.* It is said that Admiral Togo signalled twice to his fleet to fire more slowly and carefully; also that, at the end, because of

* This is not quoted in reproach to that gallant ship; her making off seaward instead of returning to Port Arthur in her temporarily crippled condition spoke well for her people, and to attempt to run the gauntlet of the narrow Japanese waters in the hope of making Vladivostok, even after making temporary repairs would have been foolhardy.

the evident ineffectiveness of his fire and the approaching exhaustion of his ammunition and other circumstances best known to himself, he was on the point of signalling to retire on Sasebo when the Russians were observed to be heading off for Port Arthur.

It may be contended that the admiral forms a part of the personnel of a fleet, and that as he fails so does the personnel fail; and this is very true, taken literally—the admiral is indeed much the most important part of the personnel. But if the rest of the personnel of a fleet inflicts more damage than it receives, the failure of an admiral to reap the advantage of the circumstances cannot logically outweigh the fact in a study of relative efficiency as indicated by material results. On August 10 the personality of the man who succeeded to the command of the Russian fleet, or possibly his lack of means to convey his intentions to the other ships, annulled at the critical moment the value of the superior situation of his command; there was every reason to think that in the coming contest no such factor would be present to influence the result, but that what advantages might lie with the Baltic fleet would be ably and gallantly utilized to overcome the undoubted disadvantages under which it would operate.

There is no doubt that any fleet leaving the home dockyards on first commissioning (as was the case with most of the Russian ships) and proceeding directly to meet the enemy, suffers a disadvantage more and more accentuated as the refinement of weapons and methods increases. With naval warfare in its present state of development, a disparity in training and what may be termed *local* practice and experience, that is to say, practice in and with the individual ships that are to enter the fight, is of more acute vitalness than heretofore; and with this farther difference, a few months passed at sea will not now diminish the inequality of efficiency to the same extent as in the Nelsonian days. A certain length of time on soundings and at anchor is now as necessary as shaking down at sea. With ordnance material so advanced and yet so backward that velocities of 3000 f. s. are obtained but the finest range-finders are impotent and useless when confronted with the vagaries of smokeless powder; with torpedoes effective at 3000 yards, and soon more; when keeping the sea is accomplished only at the cost of passing weary hours and days in coaling ship, at the expense of drills and target prac-

tice; when practice at targets and in fire-control can be had only with the co-operation of an accompanying ammunition-ship and a shelter to make it possible to transship the ammunition; in short, with the many varying and conflicting conditions and requirements of a 20th century fighting fleet, not only is the mere steaming 14,000 miles away from home inadequate to produce even fair efficiency, but such undiversified confinement and labor tells upon the physique, especially of new men. The fact that before entering the China Sea the major part of Admiral Rojestvenski's fleet had steamed nearly that distance, and the whole of it over 10,000 miles, without facilities for repairs beyond its own resources, the last 4000 miles having been continuous and at a speed evidencing no material stop,—this spoke well for it and discredited the fanciful reports of the inefficiency of its engineering personnel, while the bringing of so large and motley a collection of vessels such a distance without mishap also showed Rojestvenski to be at least a good organizer and a fine seaman. But it was only the stay in Madagascan waters that gave to officers and men any opportunity to become familiar with their weapons and co-ordinate the various factors of sea fighting. Whether or not that practice, brief and carried on in smooth water, was adequate was a question. Yet the Port Arthur fleet had been essentially without recent sea practice, and the circumstances and actual work on August 10 gave good indication that the Russian guns were well handled.

And so the efficiency of the Russian personnel relatively to that of the Japanese could fairly be assumed as at least equal in the coming struggle. The remarkable improvement attained in the interval by the latter in the various directions requiring intelligent assimilation of the finest instruction and scientific methods could not be forecasted; nor were moral conditions to be anticipated in the Russian fleet, the true inwardness of which was possibly reflected in the unfortunate events occurring later in the Black Sea. With the information at hand at the time, there was reason to expect that the man behind the gun would at least not redress the disparity in ships.

Summing up all conditions and factors as understood at the time while realizing the several inherent weaknesses of the Russian situation, it does not appear that the hope of victory undoubtedly held in St. Petersburg was unreasonable. It would

have to be bought at a terrible price undoubtedly; but the result would constitute a victory if only a sufficient force remained afloat to imperil the communications of the half million of men in Manchuria that had to be supplied with provisions and ammunition.

II.

A farther question, less easy to handle, is: With the circumstances and conditions as they actually were, could a different result have been achieved?

No other one factor in such a contest is of as overshadowing importance as the skill, nerve, and endurance of the admiral; but other things do play their important part. Was the commander-in-chief properly seconded? Was his materiel what it was thought to be? Was anything tangible effected, or affected, by luck?

A first natural question that arises is whether the Russian fleet, having arrived in the Indian Ocean, would not have done better by proceeding directly on its way without stopping, so as to arrive in the Sea of Japan while some of the Japanese ships were still possibly undergoing repairs; for the reinforcements brought by Admiral Nebogatoff were not worth the long wait, the protracted tension, and the increased assurance of the entire fleet of the enemy being ready. All criticism on this point, however, is silenced by Admiral Rojestvenski's statement that his intention was to stand right on, but many reasons, the principal of which were difficulties with the German colliers, compelled him to make long stops.

Having successfully accomplished the great work of bringing his huge command to the theater of war, the first and burning question for him to decide was as to which route he would take of the three which lead to Vladivostok. Critics are not lacking who have attributed the entire disaster to the selection which he made. Singularly enough, however, the number of those who have quoted that criticism as having been made and have then proceeded to demolish it, seems to be greatly in excess of the number of those who have actually thus condemned the course chosen.

It goes without saying that while his desire must have been to bring on a general engagement before prolonged exposure to

torpedo attack, his one objective was Vladivostok. As already pointed out, one great advantage possessed by the Japanese fleet lay in its proximity to its dockyards and the isolation of the enemy. This situation would be greatly modified, if not wholly relieved, if the Russian fleet could make its one fortified base, or put itself between it and the Japanese fleet before being brought to action. For this reason and because the efficiency of a fleet which had steamed over 16,000 miles could certainly be greatly increased by a few weeks' stay in a dockyard, it was imperative for Togo to interpose and bring on an action at once, his own ships, fresh from the drydocks and mechanics' hands, being in the pink of condition, although he would, no doubt, be glad to harass the enemy first by torpedo attack.

Such considerations may have suggested the propriety of standing out into the Pacific and endeavoring to make the Siberian coast through the Tsugaru or La Perouse straits, the distances from the China Sea being respectively about 750 and 1150 miles greater by those routes than by the direct course through the Korean Channel. One simple circumstance, however, rendered such a suggestion ill advised:—scouting, such as is now possible with wireless telegraphy, would infallibly keep the Japanese admiral cognizant of such a move, and, being on an interior line, he could proceed at economical speed, without unduly tiring his engine-room people, and always meet the enemy at the western entrance of either passage.

The course by La Perouse Strait greatly accentuated the coaling problem; for even after moving at the most economical speed and carrying heavy deck-loads, probably every ship would have had to coal before going into action in the Japan Sea. The eastern approaches to that strait, also, are somewhat intricate and difficult for a large fleet, especially in a season of fog, and present good opportunities for annoyance and attack. The one advantage which it might present was that of possibly diminishing the number of the enemy's smaller torpedo craft and even submarines which were presumably massed in the vicinity of Tsushima Island. That this possibility was considered by Admiral Rojestvenski is shown by the following passage in an order of the day issued on April 26: "The Japanese have many more torpedo-boat destroyers; they also have submarine boats and supplies of floating mines, in the laying of which they are experienced. . . . .

Torpedo attacks must not find us asleep; no floating bodies and periscopes projecting from the water must be left unnoticed."

The Tsugaru Strait presented the difficulties of being long and not over broad, possibly mined in spite of the depth of water and strong currents which of themselves constituted a danger in fog; and the enemy's fleet waiting at the western entrance would be an ideal position for capping the advancing formation if in column or doubling upon a flank if in line.

All considerations were in favor of the Tsushima Strait. Even if the decision to take it was due to imperial orders to make Vladivostok at once; or even if, as has been suggested, it was necessary for its effect upon the morale of the crews, or due to the admiral's own temperament which incessantly spurred him to active work, or to a great mental tension naturally caused by the protracted anxiety and which forbade deferring the supreme ordeal; whatever the reason, it does not seem that any other course than the one followed would have increased the chances of slipping through. And it appears that Admiral Togo studied out what appeared to him to be the best thing for his adversary to do, and paid that adversary the compliment of assuming that he would do just that thing.

The writer's opinion was that the impending battle would take place in the northern part of the Korea Channel, just beyond Tsushima, with the farther expectation that the restricted waters of the strait would be the scene of desperate torpedo attacks in the hope of possibly weakening the invader before the battleship squadrons should meet. This latter expectation was not realized, but there seems little doubt that such action was contemplated by Admiral Togo and only frustrated by various adverse conditions and play of events. As it turned out, it was all for the best for him that the flotillas were intact to supplement the magnificent work of the battleships, which they did with a dash and daring and success unsurpassed. But it did not seem probable that he would forego the great chance of making the fight more even in ships, and very likely this consideration is what determined Rojestvenski to so regulate his departure from Woosung and The Saddles as to reach the critical zone in the middle of the day so as to have daylight for passing through the area where torpedo craft might well be expected to await him.

Admiral Togo did not have to pin his faith exclusively upon

his diagnosis of the Russian commander's decision. With hardy and devoted scouts forming wireless chains, he could reasonably expect that such a vast assemblage of ships could not long conceal their movements. At the same time, aided by a power for secrecy unmatched in the days of telegraphing, with no one to betray him, and by the nature of the coasts easily screened from ships which might pass, he was master of a situation of his own creation and which he utilized with a skill which left absolutely nothing to be desired or even conceived.

One must think that the uncertainty as to the Japanese plans, so skillfully veiled, caused unending anxiety to Admiral Rojestvenski. But he evidently credited his enemy with sufficient acumen to hold the great advantage of fighting in waters adjacent to his repair ports, for he made no serious change in the disposition of his fleet from cruising to battle conditions until quite near the eventual theater of battle.

The Russian fleet could not employ scouts to much advantage, although they had some very good ones. Once at sea they could not collect information. But they knew that the enemy could. The recitation of how the Japanese scouts signalled by a simple code that the enemy was in a certain square, standing in a certain direction, at a certain speed, makes one ask in wonder if no attempt was made to prevent such communication. Not only is it a matter of course that intelligence will be conveyed by wireless telegraphy, from ship to ship if necessary, but the Russian wireless indicators showed a disturbance which could have but the one cause. It is easy and seems graceless to criticize after the event; but surely a leaf could have been taken from among the pages of recent naval history and at least the precision of such information marred. The stratagem of overhauling a Norwegian steamer and casually telling him that they would soon be heard from in the Korean Strait was admirable, especially when followed up by purposely slowing down while in the Pacific in order that the possible impression might be confirmed that the remark was an artifice and that the fleet was really bound to one of the northern passages. But when the bulky convoy was heedlessly sent to Woosung, thus proclaiming the approach of the fighting fleet, and when the wireless receivers indicated that spark messages were flying about in an unknown code showing that their presence, and probably their position, was being re-

ported, the mask could then have been thrown off and an attempt made to prevent the communication of detailed information. In the British naval maneuvers of 1902 the X cruisers issuing from Argostoli kept using their wireless apparatus incessantly, thereby blocking all signals made between the A ships and getting clear away. Also, it is related that at Port Arthur on August 10, when the Russian fleet commenced the tedious operation of getting out through the difficult channel, the big wireless station on shore began solemnly grinding out the Russian alphabet, paralyzing the weaker outfits of the Japanese pickets; the same source has it that the *Bayan,* wishing to send a message, signalled to the shore station to stop for a moment, which was done, and in that short reprieve the Japanese scouts in the offing were able to flash the intelligence that the enemy was coming out. *Se non e vero, e ben trovato.*

Be all that as it may, such tales are suggestive. If Rojestvenski, upon approaching the strait and noting the illegible disturbances recorded by the receivers, had kept his wireless incessantly at work, he would almost certainly have interfered and prevented the enemy's scouts from keeping their people posted as to his movements, especially as, for at least a part of the time, some of those scouts were actually beyond him and telegraphing over and through him. Togo probably expected him to take the western channel, between Tsushima and the Korean coast, until informed specifically that he was heading for the eastern. In his detailed report he says: "On the 27th at 5 a. m. the wireless telegraphy of the *Shinano Maru* sent me a report that the enemy's squadrons were sighted at the point 203 and that they appeared to be steering for the East channel. . . At 7 a. m. the *Idsumi,* the left wing scout ship of the inner patrol line, reported also that the Russian squadrons were sighted at 25 miles northwest of Ukushima, steaming toward the northeast. . . . The detachments were fired upon by the enemy now and then, but continued to maintain touch until they arrived at the neighborhood of Oki-no-shima and telegraphed from time to time the state of the hostile fleet. The day was foggy and we could not see beyond five miles off, yet I was informed of the enemy and his movements tens of miles off, as if I were actually looking at him, and before I saw him I knew that his fleet consisted of all the forces of the 2d and 3d squadrons, that he was

accompanied by about seven special service ships, that his formation was in double column and his special service vessels following at the rear; that he was steaming at about 12 knots; that his course was toward the northeast. Thus I was enabled to decide that I would receive him at about 2 p. m. in the neighborhood of Oki-no-shima, and that I would first attack and destroy the head of his port column."

While this precise situation, of course, could not be known to the Russians, it stands to reason that any interference with the enemy's exchange of intelligence might very possibly work important confusion or misapprehension. In this particular case the Japanese admiral had all the intelligence he needed to plan the exact place and time and order of attack. And most of it could have been prevented. Any uncertainty, particularly as to which channel was being taken, would at least have postponed the battle for some 50 or 100 miles farther northward, and this would have been a very good thing for Rojestvenski; the Japanese squadrons would not have been able to open the battle with such chessboard-like precision, but would have been hurried and in the broadened theater would have effected junction with less perfect concert of action and with crews less fresh; the meeting would have taken place at night, and with the Japanese coming up on the quarter or astern; the Japanese torpedo boats would have had more steaming in rough water and the ships' secondary batteries would have been intact for their first assaults. Quite a different aspect could have been given to the beginning of the fight, and possibly its development and finale somewhat modified.

Allusion has been made above to Rojestvenski so regulating his movements as to reach the critical zone after having had daylight to approach it, presumably in recognition of the probability of meeting torpedo boats at the entrance to the strait. This has been the subject of comment and adverse criticism. It has been urged that he should have left Woosung at such time as to enter the strait at daylight; that being generally the time of maximum fog, he could hardly have been attacked there by the enemy's whole fleet, and he would also have been able to gain the open sea beyond before nightfall with improved prospect of avoiding the torpedo flotillas. As farther argued also, if the Japanese scouts had had to signal at near midnight to Togo the presence of the Russian fleet, he would have had difficulty in

making as good haste as in the morning; and what with the fog and the greater difficulty of finding the enemy off and northward of Ikishima, the latter would have succeeded in passing beyond the dangerous zone, which would have been a great material and moral success. There may be something in that; but it hangs rather heavily upon the supposition that Rojestvenski knew just where Togo was—which is not only impossible but absolutely known not to have been the case. For validity these criticisms argue good aftersight rather than the more difficult foresight. Had the fleet traversed the immediate approach to the strait at night and lost a couple of ships by torpedoes, the unfortunate admiral would have been unmercifully condemned for such reckless disregard of what was a very probable part of the enemy's plan of battle. Placing ourselves in the position as it existed, with no knowledge of the enemy's position or plan, there does not appear valid cause for criticism; and looking at it even with the advantages of a retrospective view it is far from certain that entering the strait at an earlier hour would have made any material difference. This phase of the operations was one in which the value of speed was appreciable, but there was nothing that Rojestvenski could do to increase the speed of his fleet except possibly detach the slower units and accept battle with a smaller number of faster ships.

Whether or not there should have been a sifting out of the slower Russian vessels is a question regarding which there must be some divergence of opinion, the indisputable fact being that, as it was, the speed of the fastest had to be reduced about three knots to that of the slowest. On the other hand, the first serious drop in speed was from the 18-knots or more of the five best battleships and one armored cruiser to the 16 knots of the next five, and then came the remaining three vessels of about 15 knots.* To content himself with the first six ships, depriving himself of the battery of the 16-knot group of armored vessels would have been to assume a serious and very dubious responsibility; while the gain in squadron speed which would have been effected by dropping only the *Donskoi, Monomach,* and *Apraxine* would have been only about one knot. Had the first group been detached and taken to the front immediately after

*These are trial speeds, actual sustained sea speeds being perhaps three or more knots less.

leaving Woosung, there is no doubt that the critical zone of the strait would have been passed both earlier and more quickly, and it is far from certain that the enemy would have been encountered at all. But that could not well have been foreseen. At all events there were other general considerations, and as the particular trend of events could not be anticipated, it seems questionable whether the gain of three knots speed would have compensated for the loss of ten 12-inch, three 10-inch, twelve 9-inch, and forty-five 6-inch guns, or the gain of one knot for the loss of three 10-inch and fifteen 6-inch. The other general considerations were that in case of defeat any ships left behind would be lost practically without firing a shot; and in case of partial victory, it was important that all the fighting fleet should be in the most advanced position for making Vladivostok. *Per contra*, in the event of the main fleet forcing the passage, with the undoubted loss of some ships but after seriously crippling the enemy, the three ships of the 15-knot group, if left behind, would have been in condition to convoy the auxiliaries and get most if not all of them to Vladivostok; whereas without such convoy there would still have been small chance for them among the enemy's smaller and auxiliary cruisers.

The writer has hazarded to himself the opinion that there should have been some separation of the sheep from the goats, if only to the extent of leaving at The Saddles the seven or eight special service vessels that followed in the wake of the formation. Whether they were colliers, tank ships, provision ships, repair ships, or what not, with only a thousand miles to steam from Woosung to Vladivostok, they were an unneeded incumbrance, added to the visibility of the armada but contributed nothing to its fighting value, and under the circumstances were only "food for powder."

Reviewing up to this point, the moment of tactical contact, the entire drama has continued to unfold itself with a logicalness unmarred by a single positive misstep on either side—barring the failure of the Russians to interfere with the Japanese wireless messages. Admiral Togo's selection of Sylvia Basin on the Korean coast for his hiding place was perfect; the fleet while at anchor there was completely hidden from passing vessels by Koje Island; all wires and other means of communication were in his hands; he was closer to his wireless scouts and at least

no farther from any possible course of the enemy than he would have been in any suitable bay on the coast of Japan, and less exposed to prying eyes than even in that land of patriotic single-mindedness and devotion. His object was to keep Rojestvenski absolutely in the dark as to his whereabouts, and in this he succeeded in a way that would have been almost impossible under less exceptional circumstances.

Disregarding the cruisers and the special service vessels as foreign to the tactical formation, the Russian fleet advanced through the strait with seven battleships and one weakly gunned armored cruiser in two columns, and another division apparently close astern of the port column. Considering only the battleship squadron, the formation was technically double-column; that is to say, the interval between the columns was such that they could go to single column or to line without confusion or change of speed. To be exact, this was only surely the case in the event of gaining sea to starboard; if exigency had demanded heading off to port in single column, very possibly some confusion would have been caused by the starboard column trying to come in between the leading division of the port column and the rest. This is not quite clear at present writing. But a formation in two columns was undoubtedly the best in which to advance. No one would think for a moment of cruising or advancing in line, especially with fogs to be expected and the probability of the enemy appearing suddenly off either flank; single column would have strung out the armada to an unhandy degree, particularly for signalling; and double column, as compared with single column, has the advantages of diminishing by a half the danger in being capped, and of requiring just one-half the time to get into line or into single column heading off at right angles.

Whatever may be the formation, one must of course stand by to change it promptly if the first sight of the enemy indicates the necessity, especially as after firing has begun no reliance can be placed upon either visual, electric, or sound signals; signal flags, halliards, semaphores, aerials, sirens, whistles are all apt to be shot away. It was related of the battle of the Yalu that the two Chinese battleships, after the first cumbrous wheel, stood serenely on side by side through the remaining phases of the battle, quite ignoring either their own consorts or the enemy's vessels which passed ahead, on both sides, and astern of them, simply because

they had no means left of communicating. On May 27, 1905, when the Japanese fleet hove in sight, in column, and changed course to cross the bows of the Russian double column, there was plenty of time to grasp the situation and defeat the move by promptly forming single column, the leader regulating course to parallel the Japanese column or to threaten to cap it. All accounts and diagrams indicate that the Russians "were forced off to the eastward" or "sheered off a little;" Admiral Togo says in his report: "The head of the enemy's columns being pressed by our battleship squadron changed course somewhat to the right and at 2.08 the enemy opened fire. We held ours and when we approached to a distance of 6000 meters we concentrated a heavy fire upon the two leading ships of the enemy. Thus the enemy seemed to be pressed more and more to the southeast, and both the right and the left divisions veered their course gradually to the east, thus naturally changing into an irregular single column and steering parallel with us."

Here is the key to the whole catastrophe; there was apparently indecision or lack of purpose at a moment when it was still possible to signal and when the only simple thing to be done was to get into column at once, heading off to bring the broadsides to bear. The Russians opened fire at 9000 to 10,000 meters; the Japanese held theirs until the range was reduced to about 6000; during much less than that interval every Russian ship of the battleship squadron would have come up to and turned into the new column, with her full broadside bearing. But, as it was, there was only a half-hearted easing away, and the three leading vessels of the double column were crushed before any adequate reply could be made either from them or their consorts. As related by Commander Akiyama: "Now the two Russian ships *Suvaroff* and *Osliabya* were fired at by over ten of our ships. It is very natural that the most stubborn enemy should be defeated. . . . Now the enemy, not being able to stand our attack, changed his formation into an irregular single column. . . . *But it was too late.* . . . "

This is inexplicable, except possibly upon the hypothesis that the desire and intent to make Vladivostok had become so paramount that the one aim was simply not to be forced off the course. This theory, and this alone, can also explain the subsequent conduct of the battle on the Russian side and indicates

the cardinal error which made victory impossible. The Japanese column continued to draw ahead and by 3 o'clock was beginning to cross the head of the Russian formation, heading about SE., when the latter starboarded in succession and stood off to the northward, apparently intending to pass astern and escape to the north. This move was easily met by the Japanese going about, and the same process was repeated of pressing the head of the enemy and threatening to cap it until they again went about, which was met in the same way; the rest was a *debacle.*

With both flagships disabled, in flames, and out of the formation, and with fog and the smoke of the burning ships and from the funnels obscuring the field, it is conceivable that the remaining leader may not have had the facilities and familiarity necessary to make the battle signals, even if the means still existed; therefore, turning the head of the column from southeast to the northward, the other ships following in succession, may have been the only way to execute the movement, although it lost time and accentuated the badness of their position by bringing each ship in succession still more absolutely under concentrated fire; this was alleviated to a considerable extent by the diminution of fire in the fog and smoke, which may also have made them hope to begin if not complete the maneuver unobserved.* But why was such a maneuver attempted at all? It was not in

*In meeting this movement the Japanese reversed course by going "ships left about" in the leading division, and countermarching later with the second in the wake of the first, thus keeping the battleship squadron in the van. This shows that they still had means of signalling; to attempt a simultaneous movement like that by wireless message would be dangerous in the possibility of one or more ships' aerials having been shot away. It also shows that Admiral Togo did not consider it necessary that he should always lead; neither did Nelson; and one of Nelson's great victories, at Aboukir, was not only assured but rendered far more crushingly complete by the genius of his leading ship which without orders took the bold initiative of leading the column inshore of the enemy, helplessly anchored, thus doubling upon them in succession and then in position,—the analogue of the modern maneuver of "capping." Togo's movement was beautifully executed; the battleships of the first division were ostensibly blanketed by the armored cruisers while the latter stood on to countermarch, but that was for a very short time and as the enemy was at that period discernible only at times through the fog and smoke it did not result in any serious diminution of fire; furthermore, the fire of ships executing an "about" is nil while turning and remains disturbed until straightened out on the new course and at a steady speed, by which time the blanket was removed.

any way a matter of speed. By keeping the enemy's leader about abeam, danger of being capped would have been entirely averted, and that would have been easy enough to do, being on the inner circle, even if the difference of speed were much more than the three knots which is understood to have existed—the Japanese fifteen and the Russians' twelve. The ships of the inner circle would also have remained quite safe from any dangers of navigation, however near the wanderings might take them to either shore. By this maneuver the two fleets would have described circles, or possibly spirals from the continued endeavor of the outer one to head off the other; in course of time the paths might come together, but before that there would have been no ships left on one or the other side.

The fatal idea of getting to Vladivostok at all costs must have become a veritable obsession. In all undertakings, however humble, it is well to direct the best endeavors toward the accomplishment of one object at a time; the doctors tell us, and with truth, that one should not even read the morning paper while eating breakfast, but devote every unconscious effort of the human economy to perfect starting of the digestion. Passing from the relatively ridiculous to the sublime, what a different account might have been rendered if the Russians had dropped all thought of Vladivostok and devoted themselves with a single mind to trying to defeat the enemy! If they had started that first squadron of 18-knot ships ahead at full speed in single column immediately upon sighting the enemy, they would probably have kept abreast of him and would not have been subjected to the threat of being capped and to the temptation of trying to head off for their goal; it would then have been simply a give-and-take gun fight, in which they would probably have been worsted, as their gun work was not nearly as good as the enemy's, but they would not have started in "in chancery" and would probably at least have put some of the Japanese out of commission. Some such eventual action must have been under consideration by Admiral Rojestvenski, else why did he put the 18-knot *Nakhimoff*, with her contemptible battery of eight 6-inch, up in that first battleship squadron, making a homogeneous unit only so far as speed was concerned? The rest of the fleet, being left to their own devices, would have then been free to meet the Dewa and Uriu divisions, which, as it was, harassed them from both quarters in their situa-

tion of having to follow their leader, threw them in disorder, and ultimately destroyed them in detail. The position assigned to the *Nakhimoff* absolves the Russian commander from the oft-made reproach of mixing his units without regard to their tactical qualities; but when the time came, no advantage was sought to be drawn from that excellent disposition which made it possible.

There were other causes operating to the Russian defeat; and they were more than contributory. Some were of such importance that they alone might have decided the day with all other things equal; but had it not been for that fatal error of indecision committed in tactics, not only would the rout have been less overwhelming, but the Japanese might have been seriously maltreated and possibly have lost a ship or two.

First and foremost, the Russian gun practice appears to have been markedly inferior. Commander Akiyama, of Admiral Togo's staff, asserts that the Japanese scored about 40 per cent of hits to about 10 per cent made by the Russians. Forty per per cent of hits under battle conditions, at varying ranges between 4000 and 6000 yards, would be phenomenal shooting, and the statement may better be taken with a grain of salt. However, the relative showing is what counts, and it seems possible that the proportions may have been nearly four to one. On August 10, 1904, it seems to have been conceded that the Japanese fired two or three shots to the Russians' one, but the hits were very evidently not in nearly the same proportion. During the interval there had evidently been wrought a great change in their expertness in all matters contributing to efficacy of fire. Madagascan waters undoubtedly afforded the Russians good opportunity for target practice, but it appears that it was held only three times there and not at all in Kamranh Bay; so it may be assumed that the Russian gun-pointers were only fairly expert and that they may have been somewhat disconcerted on the day of the battle by the swell which kept even the big ships rolling a little, and that the problem of fire control had not been seriously touched. It is true, as stated by Commander Akiyama in his article, that "this skill in gunnery was attained by the practice of long years; it is not an outcome of days and months;" but such an immense discrepancy in results, as compared with the doings nine months before, points to the acquirement of very

much more far-reaching skill and expertness than mere gun-laying, important as that is.

The painting of the ships may have had some little effect upon the shooting, the pearly gray of the Japanese making them blend with the mist in a way very unfavorable to the enemy's gun-pointers. The black of the Russian hulls, on the other hand, made a most favorable target under those particular meteorological conditions. It is probable that what Admiral Rojestvenski had most concern about was torpedo attack at night, and for that reason he had had his ships painted black. It is difficult, however, to understand the object of the white funnels, which would be visible when black would not be, especially in the search-light beams at night, while the black hulls would be visible under conditions rendering the white invisible.

It appears also that many of the Russian shell failed to burst. One entered the *Mikasa,* struck, and glanced downward, landing on the engine room floor intact; others passed through decks and bulwarks overboard, doing no damage. On the other hand, all the Japanese shell apparently did their whole duty.

We have all heard the painful reports affecting the good name of some of the Russian ships' companies. Such reports may have been exaggerated or they may have fallen short of the truth; let us hope the former. However true they may have been, it seems impossible that during the fight the scenes of destruction should not have incited even the disaffected to most strenuous endeavor merely in self-defense. But irreparable harm was done before the engagement; in the crucial moment of battle, under duress, reparation could not be made of the inefficiency engendered by previous apathy or open insubordination. The unfortunate situation indicated by the tales must have had a notable effect upon the relative efficiencies of the "man behind the gun" of the two fleets and a marked bearing upon the result. For this reason reference has to be made to what would otherwise seem extraneous and needless criticism. The many kindling stories told of single-hearted devotion and self-sacrificing heroism should be soothing to the pride of those who have suffered from the alienation of certain component parts of that vast assemblage of peoples.

Such are the causes of the Russian defeat: skilful handling of the Japanese fleet throughout; a terrible initial error of hesitation on the part of the Russian commander which virtually decided

the fate of the day within an hour, but which was also followed by similarly vicious tactics along the same lines; marked superiority of the Japanese fire-control and shooting; inferiority of the Russian ordnance material as shown by the slowness of their fire and the failure of their shell to burst; reduced efficiency of the Russian personnel in consequence of moral conditions. The overwhelming completeness of the disaster was due further to the inferior speed of the Russian ships in their attempts to escape, and to the superb work of the Japanese torpedo boats.

As for luck,—by this is not meant *guignon,* not "that which happens by chance conceived as having a real tendency to be favorable or unfavorable;" what is meant is the supervening of a succession of natural causes which fortuitously operate to the advantage of one side or the other. There is something to be said here. Note this succession of natural causes: the fog, which would have helped Rojestvenski by concealing his movements in the Tsushima Strait, lifted toward 7 a. m.; the strong wind and heavy sea which prevailed during the first day's fight was naturally of greater disadvantage to the fleet less skilled in gunnery; toward sundown, when the ship-to-ship fighting ceased, the wind went down and the night remained clear, assisting the torpedo boats to complete the work of destruction inaugurated by the guns; finally, on the morning of the 28th, the fog, which had again settled, lifting quickly, favored the search, pursuit, and capture of the remnants. All these conditions, if reversed, would not have reversed nor perhaps even seriously modified the general result; but it did seem as if the very elements had conspired to consummate a tragedy unparalleled in modern history. It is conceivable that under different meteorological conditions some of the ships might have reached Vladivostok.

Reviewing the principal scenes and incidents of this great battle, weighing the actual conditions as they finally proved to exist, we are forced to these conclusions: Victory was impossible for the Russians, principally because of the inferiority of their gun-fire; overwhelming disaster could have been avoided by better handling of the fleet. The result could have been different to the extent of the Russians emerging from defeat with enough ships to constitute a fleet in being, and of the Japanese emerging from victory with the loss of some of theirs.

III.

One cannot ponder a battle such as that in the Japan Sea without the instinctive thought that at last some lessons have been told which will modify or confirm the reasonings which have gradually led to the evolution of naval war material in its present shape and to our understanding of the best means of employing it. Such is indeed the case, and the developments, while not startling, have generally tended to confirm these reasonings; and this is something of a compliment to the sagacity of naval thought.

In the summary of the causes of the defeat, given on a preceding page, the great preponderance bears upon the personnel. Every support is given to the universally quoted fact that the best man will win the day even against material odds. It only remains to point out how far-reaching is shown to be the real definition of that "man behind the gun;" he comprises the admiral, the captain, the range officer, the division officer, and the engineer officer, as well as the gun-pointer, ammunition handler, and fireman.

TORPEDO BOATS.

Among the most important deductions from the battle is that usually clothed in the expression, "The torpedo has rehabilitated itself." The honor has fallen to the Japanese flotillas of demonstrating that even in daylight can the torpedo boat go into action and achieve success. Greater daring and dash has never been shown than by the crews of those little vessels, their attacks being marvels of fury, resolution, and skill. But we must be careful not to let our admiration for the players carry us too far in lauding the play; we must take account of the stage-setting. There appears to be no doubt that the battleships *Suvaroff*, *Sissoi Veliki*, and *Navarin*, and the armored cruisers *Nakhimoff*, *Monomach*, and *Dmitri Donskoi* were torpedoed with effects more or less instantaneous. There is some dispute as to the *Borodino;* she caught fire about 6.40 p. m., and at 7.23 blew up and sank (as stated in Admiral Togo's report) supposedly from the fire reaching her magazine; a Japanese officer states that she was attacked by two flotillas and was finally sunk by two torpedoes, but it is possible that it was the *Suvaroff* that that officer saw.

Without the slightest disparagement of the valor of the men

who attacked or of the terrible effects of a torpedo hit, it would be very misleading to disregard the circumstance that no attack was made until after the battle had raged for some time, three of the battleships having been completely crushed and all very much reduced in resisting power. Admiral Togo states in his report: "Our flotillas approached to such short distances that the Russians could not train their guns to bear upon them." If this be literally true, it could only refer to the main batteries, showing that everything not behind heavy armor had been swept away. All were struck under conditions which must still be considered as absolutely essential to success. This matter is so important that it will be better to describe each case separately.

The *Suvaroff*, receiving at once the concentrated fire of a large part of the Japanese fleet, burst into flames and fell out of line about 3 p. m., disabled. While enveloped in flame and smoke she was attacked unsuccessfully by two destroyer flotillas. At 3.45 she was attacked again by torpedo craft; and again at 4.45, this time effectively, being hit on the port side aft, which resulted in giving her a list of ten degrees. Unable then to use any gun except one small R. F. at the stern, she was again attacked by a destroyer flotilla, hit by two torpedoes, and sunk at about 7 p. m.

It is related that in one case, supposed to be the *Suvaroff*, after the destroyers advanced to the attack some of the Japanese ships kept up their fire, when the destroyers signalled, "We will finish her," using the words *todome wo sasu*, which signify the dagger thrust in the throat of a defeated adversary, most significant to a Samurai and indicating clearly that the torpedoes merely delivered the *coup de grace*.

The *Sissoi Veliki*, with her battery largely if not wholly disabled by gun-fire during the two engagements of the 27th, was subjected to continuous torpedo attack from 8 p. m. until about 11 p. m., and some of these were apparently successful, for when sighted by the Japanese the next morning about 30 miles north of Tsushima she was in a sinking condition and finally sank at about 11 a. m. Her captain, however, states positively that although she was torpedoed once her sinking was caused by gun-fire and not by torpedoes.

The *Navarin*, with her battery crippled by the day's fighting of the 27th, was attacked during the night by a destroyer flotilla and sunk by four torpedoes at 2 a. m.

The *Nakhimoff* and the *Monomach*, disabled by gun fire during the two engagements of the 27th, were attacked continuously by torpedo craft from 8 p. m. to about 11 p. m., and sank at about 10 a. m. of the 28th near Tsushima.

The *Donskoi*, seriously damaged on the 27th, escaped during the night, but was sighted, chased, and attacked by the Uriu division and two destroyer flotillas and two cruisers; was torpedoed, but escaped in the darkness; kept afloat by pumping until near Matsushima early in the morning of the 29th, when pumping was stopped and valves opened, and she sank.

Apart from the crippled condition of the Russian ships, the circumstances of this battle were furthermore exceptionally favorable to the employment of torpedo boats by the Japanese in the proximity of the scene of operations to home ports, where they lay while the rough weather lasted and from whence they were called to action as the sun and wind went down. Rarely will conditions lend themselves with such notable liberality to the use of a weapon of restricted field.

It is evident from all this that while the torpedo boat is entitled to at least all the honors which it has held with greater or less continuity, it is not in a position to assail the supremacy of the battleship. Naval professional opinion has all along been fairly unanimous on this subject, and no reason for any material change has been furnished. The absolute confirmation of the theories held must certainly produce some effect upon that small group who have remained enamored of the idea of producing large results with small means. Nothing can be more completely proven than the restriction of the torpedo boat to the role of a supplementary weapon.

There may be some truth in a suggestion that in this individual event the result would not have been materially different if there had been no torpedo boats present. Admiral Togo hurried toward Vladivostok and would have unfailingly intercepted any Russian ships which, escaping destruction by the torpedo boats, might have reached the vicinity of that port; and it seems hardly possible that any that actually were sunk could have otherwise reached neutral ports and been interned. But the simple and great fact remains that a number of powerful and important fighting units can be and actually were destroyed by torpedo attack after their powers of resistance had been destroyed by the

gun. And this, in turn, points to the necessity of destroyers for the defense of the big ships after the main battle. Apart from the evident helplessness of those that were successfully torpedoed, the photographs showing the tangled maze of wreckage and debris in all parts of the *Orel* not armor-protected are an eloquent exposition of the torpedo boat's opportunity.

It may, therefore, be emphatically stated that no naval force can be considered complete or in the plenitude of its powers without a large number of both destroyers and torpedo boats. Admiral Togo's fleet is said to have had over sixty of them in action; and he says that, "Our flotillas attacked the Russian ships so thickly that the Russians had no time to give them proper reception." Here is a lesson in tactics, and in programmes, too.

Positive endorsement of the torpedo was, of course, restricted to its employment in torpedo craft, as none were discharged from any ship of the battle line. Any deduction regarding torpedo tubes in battleships is, therefore, only inferential and therefore perhaps less convincing. Every battle, however, cannot illustrate every known method of attack; and not only is it well to look at actual occurrences through smoked glasses so as not to be dazzled and led to exaggerated conclusions, but reasonings of simple logic should be applied to incidents not actively illustrative. In the Donnybrook Fair engagement off Lissa in 1866, before the day of the automobile torpedo, the keynote of Admiral Tegethoff's plan of action was to "charge at everything grey," and as a result, after three unsuccessful attempts, he succeeded in ramming and sinking the *Re d'Italia,* which had suddenly and opportunely emerged from the smoke right under his bows; as a consequence the ram then took a great and illogical spurt which has never been justified. The extreme ranges used in the battle of August 10, 1904, off Port Arthur, gave prominence and favorable endorsement to the rising idea of homogeneous batteries of one heavy caliber, based upon the diminished precision of fire from medium calibers at long range; and it also tended to cause a revulsion of sentiment in regard to torpedo tubes in battleships, the demand for which had been increasing. Now comes the battle of the Japan Sea, fought at ranges at which the 8-inch gun proved itself to be admirably efficient, and which also came perilously near efficient torpedo range. It certainly cannot be foretold that the next battle will be fought at under or over 4000

or 5000 or 6000 yards; and in the uncertainty it would not be a wise measure to cease installing the underwater tube which deters the enemy from seeking close quarters under circumstances favorable to him, and furnishes one's self with a safe and powerful weapon of offense if circumstances should permit its use. A range of 4000 yards at 26 knots or more will surely often make circumstances favorable.

No word has been heard from the submarine. It is understood that those that had been shipped across the Pacific some six months before were not yet in condition for service. Aside from that, however, the place and circumstances of the battle were quite prohibitive for craft of the size and type that were on hand. And so the submarine's baptism of fire is reserved for a future occasion,—which, let us hope, will be a long time in coming. In the meantime, with all its growing achievements, it would not be safe to ignore that coming additional auxiliary.

THE RAM.

In regard to the ram, that short-range weapon may certainly be said to have received its quietus. The development of the fish torpedo and of smokeless powder has long indicated the end of its possible utility. In the battle of the Japan Sea the opposing ships did not come even within torpedo range of each other; and beyond that, it is pertinent to note that throughout the entire war the only instances of the use of the ram have been in collisions with vessels of the same fleet: the *Yoshino* being sunk by the *Kasuga,* and the *Oshima* by a sister-ship. There seems to be no reason for continuing the practice of building ships with a protruding spur which is only a menace to friends who are always in close quarters, while the enemy ships are always far away.

SPEED.

The battle developed nothing new concerning the influence of speed. The victory was won by the faster fleet, but that does not necessarily carry the conclusion that speed was a determining factor; as a matter of fact a close study fails to reveal any material advantage properly attributable to it from the moment that tactical contact was established until the Russian fleet was shattered and its remnants seeking refuge in flight. A very general

popular commentary, so uniformly voiced as to sound almost stereotyped, has been that "the Japanese fleet by its superior speed kept pressing the head of the Russian column, continually capping it," etc. But that does not appear to reach the heart of the matter. As remarked *ante*, all that is necessary to prevent being capped under those circumstances is to keep turning away, the leader not allowing the leader of the enemy's column to get materially forward of the beam. A simple calculation shows that with a distance of 4000 yards between columns, the outer having a speed of 15 knots and the inner 12 knots, if the inner keeps heading off and the outer keeps circling to retain the same distance and threaten to cross ahead, the diameter of the inner circle will be about 16 miles, under which conditions the inner fleet will certainly not be bunched to such an extent as to present an unduly favorable target.

It is not likely that one would have either the time or the inclination to use traverse tables and enter into computations after action had commenced; mental processes are less simple at such a time than when playing chess or studying the tactical game-board; but an instinctive and natural plan would be for the leader to keep the enemy's leader about abeam,—with as little swerving as possible, of course, to help out the gun-pointers; if the enemy were to reduce speed you would insensibly tend to cap him, but in any event he could not cap you. By no conceivably probable superiority in speed can one fleet cap another if the other keeps turning away on an inner circle; nor by any such action, intelligently carried out, would there be any danger of the inner fleet becoming massed to an undesirable degree. So the apparently prevalent argument that it was by their superior speed that the Japanese were able to press the heads of the Russian columns and cap them does not appear to be tenable.

Even in the matter of the Japanese closing the range,—that is one thing that superior speed can do while still maintaining broadside fire and presentment, by keeping the enemy bearing forward of the beam. But the frequent and attractive expression that one fleet can thus choose the fighting range does not represent a wholly safe assumption. The faster fleet can avoid action *ab initio*, and can always bring on close action; but, if the other resolutely opposes the choice, it cannot maintain a long range without continually frankly heading off, and that is attended by

several grave considerations; take it all in all and considering that any preponderance in end-on fire is generally forward, no ship or fleet will be apt to place itself in the direct retreating position except to attain some important specific object. Returning to the case in point: a fleet with as many 12-inch guns as the Russians had, and no 8-inch, should be expected to prefer long range in action with a fleet carrying a number of 8-inch; yet it is more than probable that the Russians recognized that, with their limited gun practice, short range would suit their gun-pointers better; and, therefore, in the matter of the faster Japanese fleet apparently choosing the range, the closer range was undoubtedly not unfavorable to the other side and was not contested, and the greater speed was of no value in determining it.

Greater speed would, no doubt, have enabled several ships to escape in the final *sauve qui peut;* but that hardly seems a valid argument, because to provide security in case of defeat is a consideration very secondary to so proportioning and combining forces as to favor victory.

On the other hand, there is no doubt that if the Russians had had the better speed, and if the engagement had taken place a little farther on with more sea room, they could have gradually worked around the head of the other column and at least a portion of the fleet gone on its way rejoicing to Vladivostok. This was exemplified in the British naval maneuvers in 1903. Greater speed would also have taken the Russian fleet more quickly through the critical part of the Tsushima Strait, and possibly might have resulted in the action beginning under totally different circumstances and with the Japanese coming up on their port quarter instead of ahead, which would quite possibly have modified the final outcome, because in this situation and without the advantage of superior speed the Japanese might have failed to bring on a general or at least a decisive engagement. All of which would have gone to confirm the undeniable value of speed in the general conduct of a campaign and in attaining positions of strategical and even of tactical importance in individual operations. And this should not be lost sight of when noting the penury of evidence in the battle proper. Only, if in addition to the undoubted strategical value of speed, fallacious arguments be admitted assigning to it a great tactical importance as well, a false coloring would be lent to suggestions of higher speed at the

expense of the guns and armor. When the hour has come and battle is joined, it is the guns that will decide the day, not the speed.

If by the application of turbine effort, or gas engines, or mechanical stokers, or liquid fuel, or other means, ships' speeds can be increased without increase of weight, that will be progress,—a positive advance from which all may profit, and, therefore, a relative advance for none; but any who fail to keep up will effect a very marked relative retrogression. Eternal vigilance is the price of preparedness, for there is no finality in shipbuilding.

What *has* been quite positively emphasized in connection with speed, in the Japan Sea, is the great importance of uniformity in this, as in all other features, in all the vessels of a fleet. Admiral Togo suffered from wasted engine power in his armored cruisers, with the attendant diminution of their gun power; while Admiral Rojestvenski's pace was set by a few comparatively slow ships whose deficiency in engine power was not retrieved by any important gain in battery because of their small size and limited carrying power. Two of the Russian battleships were sheathed and coppered, and, although that entailed no restriction of battery or armor, yet, by association with unsheathed vessels, they lost all of the advantage sought; and, as concentration in squadrons has now come to be a necessary policy and single-ship actions between battleships will hardly possibly occur, it follows that any such device advisable *per se* is of no material benefit if applied only to isolated ships. There is, indeed, no detail of homogeneity, however small, such even as standardized fittings, that does not carry increased efficiency in its train. When it comes to reaching the important conclusion as to speed and guns, the one decision should apply to all the units of a tactical group, otherwise individual superiorities will be wasted and combined efficiency positively impaired.

Closely related to the question of speed is that of steaming radius. If the Russian ships had had greater fuel endurance, there would have been less temptation to overload them with deck loads for a passage of no great length and with a battle almost surely anticipated. *Per contra,* the Japanese, being in their own waters with coaling facilities close at hand, were able to use some of their bunker room for an additional supply of ammunition, and with the lesson of August 10 fresh in mind they took

that precaution. In spite of the development of improved methods of coaling at sea, capacious bunkers (or tanks) seem to still be important. And smokeless fuel is the best material to put in them.

DANGER FROM FIRE.

Three Russian battleships burst into flames during the action, and burned to an extent that destroyed them or put them out of action permanently until they sank or blew up. There is no telling in how many others minor fires were started; in the *Orel*, which was taken to Maidzuru, it was observed that a 12-inch shell had started a fire in a wardroom compartment which was gutted, and it is said that she was on fire three times. Admiral Rojestvenski has since stated that there was very little wood in his ships, but that the incessant explosion of shell made them seem veritable furnaces, the pumps being soon smashed and the very paint itself taking fire; he seemed indeed impressed with the great danger caused by the amount of paint which covers everything on shipboard. It seems possible that an accumulation of R. F. ammunition in the batteries may have done its share toward the terrible result; it is reported that this practice, which is common to many services, had previously led to fires in the *Rossia* and *Gromoboi*, the fixed ammunition being struck and ignited and the fires extending by means of linoleum, oilskins, decks, boats, and inflammable material. A further partial explanation may perhaps be found in a passage in Admiral Enquist's report to the effect that the "*Suvaroff* without masts *or funnels* . . . and covered with flames and black smoke, hauled out of line . . . ;" the loss of the funnels, added to the experience of the *Tsarevitch* on August 10, emphasizes the necessity of protecting the bases of the funnels up to the upper deck.

PROTECTION OF STABILITY.

At least one of the Russian ships (the *Alexander III*) certainly capsized before sinking, and probably others. Some contradiction exists in the treatment of this matter; in one and the same critique will appear a comment on the lack of stability of the Russian ships as shown by their heeling outwardly in turning, and a farther comment upon their heavy rolling which impaired the shooting and exposed the hulls below the water-line to a

greater extent than in the steadier Japanese ships,—a manifest confusion of qualities and effects. All battleships heel in turning, but it is significant that in rehabilitating the captured *Orel* (now the *Iwami*) the Japanese are so shaping the alterations as to increase the metacentric height. Still, in the *Alexander's* normal condition there could not have been any very serious lack of stability; the question is, how was her normal stability impaired? There is food here for thought along several lines, one of which trenches upon a possible neglect on the part of the ships. The error possibly committed was that of going into action with coal on deck; a heavy deck load was found still in the *Orel,* although a good deal had been used from the bunkers, and it is understood that some if not most of the others had similarly taken a supply on deck before leaving The Saddles.

There has been no known instance during the entire war of the heavy armor having been pierced, except possibly by one shot in the *Retvisan* on August 10. Admiral Rojestvenski in a recent interview stated that his ships were not pierced, but that the repeated impacts and explosions of shell against the armor sprang the bolts and rivets and shook the plates from their backing so that water entered and caused the ships to list and finally sink. This is an interesting explanation. Battering attack has been less seriously considered since the development of modern high velocities and capped shell, although in the battle of the Yalu it was indicated that the cumulative effect of a number of non-penetrating hits was more disastrous than that of several perforations. But here is now an important concrete instance, under up-to-date conditions, which should not be disregarded. The armor of the *Alexander III* and class, above the 10-inch water-line belt, is only 6 inches thick, and here is where perforation was probable and where the smashing was apparently accomplished. It is true that this armor is above water, but as there was a considerable sea on, water in serious quantities could have entered there, and this, if confined to the side, would have destroyed the stability. With a deck-load of coal to bring her down in the water, the upper edge of the main belt was correspondingly nearer to if not actually below the surface; if it be that the weight of the deck-load had been gradually offset by the consumption of coal from the bunkers, then two powerful agents of instability were working in unison.

This dramatic incident puts in question the practice of fitting longitudinal wing bulkheads unless means be afforded of promptly relieving the burden possibly imposed on either side. In the *Alexander III* there was a 4-inch armored bulkhead about eight feet inboard, which virtually formed a downward extension of the protective deck; the wing passage thus formed was apparently unprotected at the top, and water entering near the waterline evidently found its way down there through open or disrupted hatches or scuttles. In the *Suvaroff* the same arrangement existed, and it will be remembered that, when torpedoed, she took a list of 10 degrees, which prevented using the battery. It was the same with the *Borodino,* which, according to some accounts, also turned turtle. On the other hand, a 1¼-inch bulkhead, some 15 feet inboard, was all that saved the *Tsarevitch* after being torpedoed on February 8, 1904; she listed about 18 degrees, but was righted by filling the corresponding wing compartments on the opposite side, which increased her draught aft about five feet, but left her able to navigate and enter port. It is quite patent that a heavy bulkhead affords protection to the vital interior of a ship; but it seems to be equally evident that capacious drains should connect corresponding wing compartments on opposite sides, fitted with valves which may be opened or shut at will. Valves are not like doors.

Apart from the care of the water when it once gets in, it seems that in order to keep it out the heavy armor should be carried well up, for battleships are not expected to fight in millponds; monitors are good enough for that. With the impending increase in heavy batteries at the expense of the intermediate, and with perforation shown to be not the only danger, the possible value of thin armor for keeping *something* out becomes greatly reduced, and the fate of the *Alexander III* seems to cry aloud in support of the plea to devote all the weight of thin broadside armor to carrying up the main belt as high as possible, undiminished in thickness.

SCOUTS.

The great importance of the work done by the Japanese scouts need hardly be commented upon. The only question that has ever arisen has been as to the means, and a new implement has sprung into the arena. "The battle of the Japan Sea was won

by the wireless telegraph," is the reported exclamation of one enthusiast. And there is no denying that it did marvelous work. It was by means of it that the Japanese commander learned of the approach of the enemy and understood, while still miles away, his exact strength, position, formation, course, and speed, and could make his initial moves before sighting him or being sighted by him. It is worthy of note that the first intelligence of the enemy was flashed, not by an armored cruiser or even by a protected cruiser, but by a large merchant ship scout, the *Shinano Maru*. Torpedo craft had been used as picket boats off Port Arthur, being fitted with wireless and being thus also ready to oppose any night sortie; but a sound appreciation of the difference in conditions was shown in now keeping them for their legitimate work and not assigning them to duty as high-sea scouts. Apart from wearing out the crews, to attempt to combine the two types would indeed result in a hybrid of minimized value. Destroyers may possibly come to be larger than at present, for their own purposes; but information service is *sui generis*, with an importance all its own. Speed, and size to maintain it in a seaway, are the prime requisites, supplemented by powerful wireless apparatus and enough battery to prevent being driven off by torpedo craft.

Whether or not the wireless was employed as a means of signalling to the fleet during the action is not known at the present writing; it is most improbable. But we read farther in Admiral Togo's report of how Admiral Nebogatoff's squadron was intercepted and surrounded: "At 5.20 a. m. . . . I received a report from our cruiser squadron which was about 60 miles behind steaming to the north, that several columns of smoke were seen in the east. Soon after, the same squadron approached the enemy and reported again that the enemy consisted of four battleships (afterwards it was found that two of them were coast-defense ships) and two cruisers and were then heading northeast. It was certain that those ships were the principal remnant of the Russian fleet. Upon this the battleship and armored cruiser squadrons reversed their course and gradually steamed toward the east so as to appear at the head of the enemy . . . and at 10.30 a. m. we completely surrounded this enemy . . . " Greater tributes to the success and value of this invention would be difficult to conceive. It now remains to accomplish selectivity, with all that the term implies.

Incidentally, it may be remarked, Admiral Nebogatoff at least, undoubtedly remains impressed by certain disadvantages attending the use of soft coal.

ONE-CALIBER BATTERIES.

"A prominent Japanese naval officer" is quoted as deducing from the battle the opinion that "in the armament of a battleship there should be not only 12-inch guns but also 10-inch and 8-inch, with an auxiliary equipment of 6-inch pieces." The same officer, however, in speaking of armored cruisers, is made to say that "There can be no doubt, however, of the inferiority of four 6-inch pieces to two 8-inch," which seems rather to invalidate a portion of the former remark. Vice-Admiral Saito also has expressed himself in favor of 6-inch guns. The Japanese fleet closed somewhat with the enemy in order, no doubt, to bring within effective range their numerous 8-inch guns, of which the Russians had none; and the fire of these was apparently most accurate and effective. But it is to be observed that in none of their ships was a 10-inch or a 12-inch associated with anything heavier than a 6-inch, with the single exception of the *Kasuga*, which carries one 10-inch and two 8-inch. The same applies to the Russian ships with the exception of the *Nicolai*, which carried two 12-inch and four 9-inch. Eight-inch guns (properly installed and protected) are very formidable and excellent weapons; but, given the flatter trajectory and the greater natural accuracy of heavy guns; given the present uncertainty of combined fire due to the erratic performance of smokeless powder; given above all the indubitable fact that the *Osliabya*, *Suvaroff*, and *Alexander III*, which were so quickly put out of action, received their maltreatment at the hands of the leading ships of the enemy (battleships) and were, therefore, evidently crushed by 12-inch fire, we should be chary of accepting opinions from however high a source challenging the present tendency to restrict main batteries to one large caliber. More to the point is the opinion of the defeated Rojestvenski, who spoke wisely from the depths of his bitter experience: "Battleships carry a great many small guns of 1½ to 2-inch caliber, which make a great deal of noise and do no earthly good; moreover, their crews, having no protection, are immediately killed. In future battleships should carry no guns smaller than 3-inch, and very few of those. The only role of these

small guns is to repel torpedo-boat attack. The only guns for battle are the 12- and 10-inch pieces. Guns of this caliber alone have the power necessary for naval fighting; handled by cool and well-trained men these will be for many years the kings of naval battles." In France, M. Lockroy, former Minister of the Navy, reached the tersely expressed conclusion that "The ideal should be a single type of projectile, a single type of gun, a single type of ship;" which sentiment is echoed by M. Charles Bos in the recent report on the budget. England, not tarrying to talk, is already about to launch the *Dreadnaught,* carrying ten 12-inch.

BIG SHIPS.

Intimately connected with the tendency to accept as the ideal a single type of gun, is the present leaning toward bigger ships, for the reason that bigger ships are admissible only if they carry heavier batteries, and the only way in which batteries can be adequately increased is by unifying the calibers. The big ship proposition is without doubt the most interesting now to the fore; but in trying to draw light upon it from this battle, all that can be done is to weigh the pros and cons and try to determine how a change would have operated on that occasion.

For all service other than a fleet action, diffusion of power is needed, within certain limits, of course, which limits are a matter of judgment and not of mathematical calculation. But as participation in a fleet action is the one great function and *raison d'etre* of a battleship, the question should be studied solely from that point of view. Initial comparison will be best made by consideration of two fleets of equal combined tonnages but with different numbers of units having armaments in proportion to size. Questions of space and its adaptation operate so as to make the problem of increasing heavy gun armament proportionally with the displacement a complex one; for instance, while one gun becomes a large proportion of the whole, an odd number of guns, such as nine, is impossible without accepting at least one single-gun turret, and wasting upon it the choice middle-line position; or in a ten-gun ship there can be no gain in broadside fire over an eight-gun ship without resorting to single turrets, and it is very doubtful even then. It is, therefore, difficult to exemplify the case with ships and armaments as it may be found possible to develop them; but the principles involved will be quite well

illustrated by supposing an engagement between six ships of 16,000 tons and four of 24,000. As the former can carry a battery of eight 12-inch guns, the latter may be allowed twelve. Then the opposing fleets will each carry 48 guns.

We are now immediately confronted with a salient and incontrovertible fact: with equal numbers of guns in the two fleets, the smaller ships will present the heavier combined broadside. The six cited in the comparison can fight on either side their entire battery, or 48 guns; while the other four can at the very most fight ten on either side, or 40 in all. As a partial offset the end-on fire of the larger ships may be heavier individually, though probably not so collectively.

The big ships will present better targets than the smaller ones. The total target area of the six smaller ships will, of course, be the greater, but the target for each shot is a single ship, and the proximity of another ahead or astern does not increase the chance of hitting. As far as hitting is concerned, the four present the better targets, each being longer, broader, and higher.

Fire control at battle ranges is naturally dependent upon observing the falls and correcting the range. There are consequent objections to directing the fire of any one ship at more than one target, because each target requires a separate fire control station and system, and fire control stations are limited, beside being apt to be knocked out. Therefore, the four big ships would possibly operate at a disadvantage if firing at more than four of the other fleet.

The loss or the disablement of one of the big ships by accident or injury to steering or motive power or otherwise would be in more serious proportion to the whole than that of one of the smaller ships. And furthermore, the injury inflicted on any one larger ship by a single shot would never be less and would often be greater in effect upon the total force engaged than the same injury to one of the smaller ships, *e. g.*, the death of the captain, damage to a boiler uptake, jamming of the steering gear, etc.

The six ships will form a longer column than the four, and, with the centers abreast, they would overlap at both ends; but this overlap will be modified by the fact that 24,000-ton ships will almost certainly maneuver at greater distance than 16,000-ton ships. Should the latter maneuver at 400 yards and the former

at 500, there would be an overlap at each end of 250 yards, which is immaterial at fighting ranges. The advantage of any concentration effected in big ships will be felt when opportunity offers to emphasize tactical concentration; when the squadron of four is abreast of or projecting beyond the van or rear of the other, all of the four may be able to concentrate their tremendous fire on a few of the others, while some of the long column of six will be out of effective range; in the extreme case of capping this advantage will be still further greatly emphasized. And this is the situation which was presented in the battle of the Japan Sea. If the Japanese ships had been larger, *with batteries in proportion,* they would have had increased advantage in capping the Russian column. If, on the other hand, the Russians had had heavier ships with batteries in proportion, they would have been able to reply more vigorously from the heads of their columns. Concentration, within practical limits, will undoubtedly be of advantage in fleet actions; that is to say, concentration of guns; the ship is of no importance except as the gun-carrier.

The opportunities for speed in the larger ship are greater, because with the greater length a fixed ratio of engine weight to displacement will result in a continued increase of speed as the displacement increases. Also, any difference in fuel endurance will be in favor of the larger ship, because with the greater length and the increased maximum speed, the most economical steaming will be at a higher rate of speed; the fleet harbor consumption may also be less in the smaller number of larger ships. Furthermore, the weight of hull for the same strength is relatively less in the larger ship, leaving a margin for additional power or fuel.

Other minor considerations are: The bigger ship will be the steadier platform, and it will have the advantage of single direction of the greater proportional amount of offensive power; also the larger ships will occupy less sea and the group will be under better control, especially in smoke or fog. Decrease in the personnel and in the cost of both construction and maintenance will also favor the smaller number of bigger ships. Handiness, once of great importance when single-ship actions at close range were possible, is no longer a considerable feature and can not be cited in favor of the smaller ship.

The comparison stated between the two types appear to result favorably to the smaller ship, because the restriction of total

broadside fire seems to check the possibilities of increased concentration. Evidently it is not a cut-and-dried proposition. There are considerations, however, which may not appear in an academic discussion of features with inflexible percentages of weight and equalization of total tonnages, but which nevertheless do enter into the actual problem. Considering the matter in its general aspect, serious increase of total battery power being rendered possible by unifying the calibers, the field open to the naval architect is to increase the *available* fire in proportion to the size and importance of the ship. It so happens that with two-gun turrets the relation of a normal size of ship to the size of gun now universally adopted is such that an increase in displacement may not be attended by a proportional increase in the number of broadside guns, if the percentage of weight devoted to armament remain the same. But there are various ways of effecting concentration of gun power: for instance, eight 13-inch guns are more formidable than eight 12-inch similarly disposed; or, with three guns in a single-deck or double-deck turret, the strength of broadside fire may be made a larger percentage of the whole; or other expedients may suggest themselves.

If, in a ten-gun ship, there cannot be effected any increase in broadside fire over an eight-gun ship; and if the battery of a twelve-gun ship can be so disposed as to present ten on either side, then the ten-gun ship would better be left wholly out of consideration and study be confined to the twelve-gun type. That would be a very big ship, requiring deepened harbors and canals and larger docks, and, far from being immune, it would be increasingly open to dangers of navigation, collision, and torpedo and mine. It is doubtful if such a size would be advisable from the standpoint of maximum fleet efficiency. But if increase in power be decided upon, there is no use in taking half-way measures if they do not produce a commensurate augment of gunfire; the gain in speed alone would not justify an advance in size. The whole question is as to the practicability of obtaining a proportional increase in *available* fire; if it can be done, there is no doubt that fleet efficiency will be increased by the possible concentration. General Forrest's intuitive conception of tactics, popularized in the rule to "get there the fustest with the mostest men," may well be paraphrased for sea work "to get at the leastest ships with the mostest guns."

In a certain sense, to quote a recent remark by Lord Brassey, "shipbuilding for the navy must necessarily be an answer to construction in hand elsewhere." This applies primarily to the amount of tonnage; but it applies with no less vigor to types. If other nations were to build nothing but torpedo boats and fast protected cruisers carrying 6-inch guns, there would manifestly be no reason for building battleships which could resist 12-inch guns. As some nations are building heavier ships, it is doubly incumbent upon the others to determine the best way of meeting the changing conditions.

There is but one thing more to be said about it, and this is indeed the crux of the whole question. The practical outcome in any country will be, not a restriction to a certain tonnage expressed in larger units, but about the same number of larger units. This being the case, there is no doubt that the safest way to ensure at least equality, if not superiority, of fleets is to ensure at least equality of ships. So it really comes back to a question of how to produce the most efficient, hardest-hitting single ship. There have been most attractive accounts published abroad lately of expected combinations of gun-power, armor, speed, and endurance, so far ahead of anything yet produced as to indicate nothing short of actual revolution in means and methods. If these designs materialize in actual ships, other services can but "hide their diminished heads" and yield tribute in that sincerest form of flattery—imitation. It remains to be seen how far those flamboyant expectations will be realized.

AMMUNITION.

The writer is not prepared to follow M. Lockroy in the advocacy quoted above of a single type of projectile, although apparently this battle was won mainly by common shell. The Japanese evidently used very few armor-piercers; wherever the *Orel's* armor had been struck the shell had simply splashed on it; and all those that had struck above the armor had burst immediately into hundreds of little fragments, the radius of destruction of even the 12-inch seeming to be limited to about 15 feet from the point of impact. Throughout the entire war the favorite practice of the Japanese appears to have been to use common shell to wreck the unarmored parts and demoralize and kill the personnel; and

throughout the entire war the comment of able observers and critics has been that their shell have such sensitive and quick-acting fuses that they burst on striking even such light things as funnel casings, Chinese tile roofs, etc., while the character of the bursting charge is such that the explosion, while terrific in instantaneous force, lacks volume. The effects in every case noted were very much localized; in some instances they were actually exterior to the ship, while in others hammocks, men's bags, etc., afforded adequate protection from the fragments. Yet these shell destroyed several battleships, and by wiping out all means of secondary offense in others put them in condition to be easily disposed of by torpedo boats. Furthermore, while the fire in the *Alexander III* must have been caused by common shell, it seems probable that the same instrumentalities are to be credited with the injuries which made her capsize.

Two of the Japanese battleships had each a 12-inch gun disabled during the action by the premature explosion of a shell in the bore, which same accident is understood to have occurred several times on August 10 with more or less disastrous effects. Whether these prematures were caused by supersensitiveness of the Shimose burster or fuse, or by weakness of the shell, or by erratic action of the cordite propelling charges causing excessive pressures, is not known. Leaving it to the victors in the battle to decide for themselves whether or not the doubtful advantages of such sensitive material are commensurate with the dangers of handling it, there will probably be no resulting tendency to greatly modify the character of ordnance material generally. In regard to what kind of shell to use, the suggestion is manifest that if torpedo boats are on hand in effective numbers and condition, the common shell will pave the way to successful attack by them.

While on the subject of projectiles, the opportunity cannot be neglected of pointing out the possible usefulness of a few stand of grape or very heavy case-shot for each heavy gun, for employment against torpedo craft. This may seem to smack of using a steam hammer to kill a fly, but when circumstances approximate to those at the end of the day fight of May 27, when all unprotected guns had been swept away, a round or two from a 12-inch gun would be well expended in crippling a torpedo boat.

UPPER WORKS.

An emphasis, which should not be needed, has been laid upon the dire effects of upper works and fittings when struck and converted into langridge. As a single instance among many, it is said that on board the *Mikasa* 23 men were killed or wounded by fragments of a semaphore struck by a shell. (It seems possible that some of the shell fragments were mingled with those of the semaphore.) There were also incidents recalling the experience of the *Tsarevitch* on August 10, when her military mast, almost wholly shattered in its support by the explosion of a shell, was in a condition to endanger or to seriously impair the efficiency of the ship. All upper works must be designed so as not only to offer the minimum target but also to minimize the effect of shell striking; superfluous bridges and derricks must be done away with, and masts and smokestacks, etc., must be well stayed.

ARMORED CRUISERS.

One final circumstance well worthy of note in connection with the conduct of this battle, is that the position, and the only position, assigned to armored cruisers on either side was in the line of battle. All theories that have been advanced as to the roles to be played by vessels of this type have failed of confirmation. If the Russians had had an effective scouting and anti-scouting service, it might have been necessary for the Japanese to do their scouting by reconnaissances in force; but throughout this entire war armored cruisers have played no important part as such. Three large ones were at Vladivostok at the outbreak of hostilities, and the Japanese told off an adequate force of the same type to watch and if possible contain them; their presence on one side furnished a use for them on the other, and it must be admitted that the principle *similia similibus curantur* has some application in the determination of naval programmes as well as in homœopathic therapeutics. There is no doubt that the steadily converging paths of development of battleships and armored cruisers are nearing a point of junction. Some years ago 10-inch guns began to appear in the battery of the latter, and the speed of the former has continually increased. The two types have thus unmistakably approached each other, and the assignment of the cruisers to positions in the line of battle emphasizes the true nature of their most important and ultimate function; and in

performing this function their two to five knots' greater speed was not utilized while they suffered a serious diminution of battery power for the sake of obtaining it. The Japanese are said to be now building heavy armored cruisers to carry 12-inch guns with some 8-inch in one and a number of 6-inch in another; but, victorious as their fleet was, its lack of homogeneity seems to impugn the soundness of their programme. Although these new vessels will carry heavier guns than any cruisers built heretofore, they will presumably be faster than battleships, and there may arise circumstances in which they will be useful; but the refinement could go still further and useful work be found for still a third type with a little less speed and a little heavier battery. The question is—is such a multiplicity of classes desirable? In a service which can afford the luxury of both, there may at times be a useful variation from the standard type of battleship; but if it is a question as to one or the other, there is no avoiding the plain fact that in the battle of the Japan Sea and the operations leading up to it, and indeed throughout this entire war, the armored cruiser has failed to justify its existence.

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Such seem to be the principal gleanings from the Sea of Japan, and deductions of a reasonable logic crystallized in the fierce light of that epoch-making battle. While the event does indeed mark a new era in naval history, it is noteworthy and a most interesting circumstance that the suggestions emanating from it are in the main confirmatory of peace-begotten theories and practices based upon professional judgment. Lights and shadows have become a little more pronounced, while we are reminded that nature will not be coerced and that her immutable laws must be invoked in aid, not violated.

After all is said and done, nothing remains so steadily confirmed as the supreme influence of the human factor, the personnel, the man behind the gun. More important than the production of the finest weapons is the production of the finest skill and nerve and endurance in using them; and this can exist only hand in hand with the familiarity born of constant practice by all, from the admiral and the captain to the gun-pointer and mechanic. In commenting upon what seem to be the lessons from this direction, as from others, criticism of personnel has been a far less agreeable task than discussion of materiel. But

in distilling future guidance from past achievement it is not possible to wholly follow Emerson's sweet counsel not to bark against the bad but rather to chant the beauty of the good. It is from failures that the most pointed teachings are drawn. The battle of the Japan Sea has thundered forth anew the lesson that bravery is not all that is required—else there had been no such defeat.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THIRD HONORABLE MENTION.

THE PURCHASE SYSTEM OF THE NAVY.

BY PAY INSPECTOR J. A. MUDD, U. S. Navy.

Motto: *Better have all parts equally strong.*

The laws and regulations governing the purchase of supplies for the naval establishment should aim at obtaining only the quantity and quality necessary for perfect efficiency at the lowest market price with the least expenditure of money on account of administration.

GOVERNMENT PURCHASING DISTINCTIVE FROM COMMERCIAL TRADING.

Before discussing even in a general way the laws and regulations necessary for carrying out the principles here laid down, several elements that make government buying distinctive from ordinary commercial trading should be noticed.

First.—The result attained will deviate from that desired, in consequence of the purchases having to be made from the people who compose the government.

There is an influence here that should not be ignored in any purchase system devised. Our whole commercial world has the broad right of entering into the competitive field for doing business with the government. Merchants in good standing may not be barred by individual caprice or opinion, as is permissible in private business. In transacting the public's business, though, its servants particularly engaged therein must keep in mind the principle that the work should be done " with the least expenditure of money on account of administration." No system could be elaborated as to competition among those of the commercial world simply on the unbusiness-like demand of the assertive citizen who seldom means business but always wants his rights. Nor should a system be so niggardly in its embracement that merchants would

have to resort to extraordinary measures to learn when the government is in the market as a buyer, and competition so limited that dishonest favoritism would be made easy. There is a long economical measure, though, between a method based upon an unreasoning demand that the government, when it becomes a buyer, inform individually all of its citizens who are sellers of what it wants, and a healthy system that avails of the disseminating facilities of the press and the public place to announce the government's presence in the market. But, to repeat, the point aimed at can never be reached, because of the fact the government is buying from its citizens. The expenditure of money for administration in obtaining the quantity and quality of supplies desired, at the lowest market price, will generally be greater than in the best ordered portion of the commercial world, because of this element entering into the work.

Second.—The government is a unique buyer. It has no correspondents, nor can it enter into any original transactions involving trade obligations. All trade favors shown the government must cease in influence with the particular transaction involved. The letter of the law allows no favor to be shown by the government as a buyer. More important still, the government is never, practically, in the market as a seller of goods. It can never be looked forward to as a partner in a future combine or as a commercial friend to help others out of tight places. There cannot be any honest give-and-take in business with it. This element is serious as affecting the work towards perfection in a purchase system, and cannot be overcome by law or regulation.

Third.—The fact that the naval establishment is a military organization affects in an unbusiness-like way the steps taken in making purchases for the navy.

The *military* power of the establishment should be applied nowhere in the working of the purchase machinery except when it is used in an economic sense as a *business* force to attain the desired result. "Military" is used here in its most distinctive sense. Not a paper nor a signature should be demanded for the sake of mere military form, the reason for which arises from or leads to no business necessity. No individual action should be delayed for report to military authority which in the business order of things cannot affect the result.

Here is an element of serious import which, in framing laws

and regulations to carry out the principles of a sound purchase system for the navy, should be constantly borne in mind.

The three elements just mentioned might be called the handicap with which the naval establishment enters the field in making its purchases. At the present time all three affect the results and will continue to affect them to a greater or less extent under any system that may be devised. It will be well for acute critics to bear this in mind.

CRITICISM OF PRESENT METHODS.

Aside from the distinctive conditions, that to an extent cannot be overcome in practice, the present methods of purchase are not well ordered. The critical exposition in detail of the system cannot be undertaken in a paper like this, for every detail of adverse criticism should be followed by a suggestion of something better, unless it uncovers a superfluity. Such exposition would also involve the proving of statements by citing authentic cases, and of arguments to meet counter statements that it is intuitively known would be made. This would result not in a paper but in a book.

To attain the best results it will not be necessary to construct an entirely new set of machinery of different design made of all new material. The present system is far from being so bad as that. What is needed is a certain remodeling along the same type. Much of the old material can be used; some in the exact form as at present, and other portions, after being returned, reinforced or polished up. Here and there it will be necessary to take out a rusted or even broken part and replace. The increased power desired will necessitate the addition of some more modern parts and the relegation to the scrap heap of certain ancient attachments.

The dissatisfaction which results under the present purchase system is due to faults in both construction and administration. To dissect and to criticize in a paper like this, the writer must not only have had experience but should approach his task with all the judicial acumen of which he is possessed and with the intention of applying the test of common sense to everything. He must constantly guard against the allurement of unsupported theory. The theorist, with his intelligent and well-trained mind, draws the beautiful and complete plans in his studio. The worker, with no

eye to beauty and little care for the co-ordination of parts, tries to follow a direct road of "get there," with only in mind his particular achievement; and he will brush aside, if possible, the parts that are useless to him individually. The theorist cannot control the worker entirely; neither can the worker, with the necessary restraining forms around him, put there for the sake of the final result, have his way entirely. So comes compromise, in order to accomplish anything.

Methods that are not sufficiently abbreviated for use in war time should not be adversely criticised for that reason alone. It would be a poor policy in working out a purchase system to curtail to answer at every point the conditions found in war time. That idea is right in the strictly military branches of the naval establishment, but wrong and really an abuse of public trust when applied to our business branches, which have to be worked during more years of peace than months of war. In time of peace the navy's business methods should conform as nearly as possible to those of commercial life in their exact completeness. When war comes it will require no particular training for those in authority to lop off anything that interferes with the fleet succeeding in its tasks.

And still another thing to remember. Nothing should be condemned by the critic unless he has something *better* to substitute, unless he be only taking out something superfluous. "Just as good" will not answer, for swapping methods of equal value is undignified in public affairs and is also expensive. This is the age for the advancement of the young in power. But the healthy young brain with inventive genius still needs the regulator of the healthy old brain with experience. No change in methods should be made until every part of the proposal is carefully weighed. No substantial old structure should be torn down to make way for the elegant skyscraper until it is proved that the modern affair will bring in returns that will in a business sense offset the loss of the old and the cost of the change.

THE FIELD OF COMPETITION.

There is practically no limitation as to what merchants may bid for furnishing naval supplies. It is stated that bidders must be regular dealers in the supplies bid on. Custom has given much latitude on this point, and most anyone desirous of doing a general

business with the navy has hardly anything more to do than to establish some sort of an office and make a bid.

The question of dealing with the middleman is a knotty one. It is doubtful whether he could legally be barred from bidding, for after all he is a commission merchant. His presence in the field, although useful to the service at times, is bad for the best work of the system. There are manufacturers and regular dealers who prefer doing business with the navy through the middleman, and refuse to bid directly. Their principal reason for this course is to avoid the annoyances connected with the navy's methods of purchase. It is more satisfactory to them to deal with the commission merchants whose methods are their own than treat directly with the government's ponderous business machinery and its arrogant officials. The middlemen, making a close study of the navy's system and with a sharp eye to all prospective bidders, with undaunted persistence, along with a deep humility that silently accepts unjust, and sometimes insulting treatment at the hands of those in authority, manage to score enough times to make their business profitable. But the navy pays more for its supplies. The present usefulness or even necessity of the "general" supply merchants comes from the faults in the construction and administration of our purchase system and does not exist as a matter of course. But the business of the navy is far from being done entirely with middlemen. They are mentioned here only because they have an important bearing on all efforts to promote the efficiency of the system.

No well organized effort has been made to get a greater number of reputable manufacturers and dealers to become regular bidders. Missionary work is required at this point; but the hardest of it would come in the first few months of the effort: after, the task would simplify itself. The work must be along the lines of encouraging the manufacturers and regular dealers who have not heretofore done business directly with the navy to enter the field of competition under their own names.

There has always been much liberality in handing out the printed schedules of supplies wanted; no applicant having much trouble in obtaining the two copies necessary for bidding. But the idea has been that advertisement covered all the effort the government should make towards enlisting the interest of the commercial world in its business. This will be considered as

correct by most of those intimately connected with the purchase of supplies for the navy. They know that the extra effort proposed would require, for the time being, more clerks of a high order of intelligence; and clerks are harder to obtain than ships, sailors or marines.

At the purchase offices in the large cities there should be intelligent effort made to enlist the best element in the navy's business, and resort should be had there to special letters and interviews in the case of important supplies and material.

To write frankly, it seems that the work heretofore done along these lines has lacked that great modern essential in successful business—*Enterprise.*

PURCHASE OFFICERS.

The position of purchase officer at a navy pay office is one of the most important in the business department of the naval establishment. The officers for this work should be carefully selected and such selection based on fitness alone. The results exacted of these officers should be such that the positions they fill could not possibly be looked upon as "soft berths." There are wanted men in these places, the proper conducting of which is so essential to the efficiency of the service, who will not be content with taking a mere ordinary interest in their work, but who will still further build up and promote efficiency by striving. The rapid increase in the material and personnel of the navy necessitates more thought for securing modern methods for accomplishing things. It is better to advance and run the risk of being damned in the excitement of controversy and rivalry, in the onward rush of progress, than sit still and surely be damned in calm derision.

There is good material now in the pay corps and it is being added to with each batch of recruits. This good portion, much in the majority, should be constantly encouraged by wise administration, so that its heart be not destroyed by the riding of incapacity, the favorite child of outside influence, over merit. To get the greatest quantity of good material in the higher grades it will be necessary to be ever watchful in taking in the raw material at the bottom. No matter how close a scrutiny is given the entering candidate, a bad egg with an immaculate shell will slip in now and then. Once in the service, the lazy ones, the indifferent ones, the utterly worthless ones are soon identified; and then comes one of

the highest duties the members of the pay corps can perform for the government, and that is, in the form of examining boards for promotion, rid the service of these useless and expensive men. The government is entitled to a square deal as well as individuals.

Special effort should be made to train the young pay officers to a closer relationship with the commercial world. They should have a good grounding in the cost of ordinary supplies and of the qualities needed for the navy's uses; of the principal markets for the different articles; and of the units of sale and the size or weights of common commercial packages of the same. After their first cruise they should be sent to general storehouses or to purchasing offices and there made to do *hard* work. The most pathetic sight, from the view point of efficiency, is the young man, after a dog watch experience in the pay corps, seeking a soft billet on shore where he will have no boss save the military commander. Before an officer is promoted to full paymaster he should be required to have at least a theoretical knowledge of the duties of general storekeepers and purchase officers. He should be able to describe the uses of every official book and paper used in storekeeping and purchasing.

The purchase officer at a navy pay office should have an assistant in the person of a pay officer of long enough service to have proved his ability. The assistant should be retained through a full tour of duty. In times past such assistants have occasionally been detailed, but after short service, taken away. With the increase in the pay corps it will not be long before there will be young officers available for this work. The duties of the assistant should be so interwoven in the machinery of the organization of the office that, were he removed and his place not filled, the vacancy would make itself felt. In time of war the principal purchase officers should each have three or more such assistants, to take station in the technical departments of the adjacent navy yard and there expedite matters by representing in action the central office.

ORGANIZATION.

The purchase offices should be organized and fitted up in the most systematic way for facilitating the prompt and accurate despatch of business. The words, organization and system, and the phrase, systematic organization, are much used nowadays, and they

cover a multitude of sins. What is meant in this paper by organization is a systematized arrangement of all the necessary forces at command so that they may produce the desired result in the least possible time allowable under the economic necessities of the work. The perfect organization would be where not a mite of the power at disposal was left in unnecessary disuse for a second, —where not a cent of the public money was expended in administration without the return of a cent's worth of the something wanted towards the accomplishment. The forces that should be at command are not only the personnel of the offices but all the mechanical contrivance and time-saving methods and rules that inventive genius has put within the reach of the business man of today. Waste of time, and therefore money, through lack of modern organization in public administration, is unpardonable at this day and as near akin to theft as manslaughter is to murder.

An organization should be equally strong in all parts. It is seldom so, though. But where it is started thus it cannot be kept so for long unless all parts are fully exposed at all times to those connected with or concerned in its working. Secrecy, veiling a part of the machinery, may become absolutely necessary in a certain organization, but the minute such condition is established the whole plant is placed positively where it was not necessarily before—*in the danger zone of disaster*. The hidden part may become rusted or weakened and fail to creak and attract attention, while the great and healthy mass of the organization outside in the light keeps on revolving. Some day, instead of a creak comes collapse in under the veil, and then, mighty destruction without. In very nearly all cases of organization on a great scale in this co-operative age it is really economy to keep all parts exposed at all times. The ethical influence of such proceeding is tremendous. Would that the picture of the stately, white-haired bank president in his office at the transparent *front* window were not so often a fiction as to indicating that beyond. Would that this pretty tableau oftener stood for the whole truth of that in the rear.

DELINQUENT CONTRACTORS.

An element that perceptibly affects the efficiency of the purchase system is the merchant who seldom entirely keeps his contracts or promises but who insists on dealing with the navy.

A purchase officer should use to the full extent his authority for canceling his orders, under which there has been default, and placing them elsewhere, after assuring himself that the government is not at fault. To perform this duty properly he must have at all times a good working acquaintance with the details of the purchase business of his office. That is, he must attend to his business.

In private life, if one had constant trouble with a merchant with whom he dealt in the way of broken promises, inferior goods, etc., he would, for his own protection, cease dealing with him. The navy has been a great sufferer from the methods of these designing and slip-shod fellows. When it is proved that a merchant is not trying to live up to his promises, then his name should be stricken from our list. And the government is under no obligation to deal with him again under promise to do better. No government official has the right to be kind in an unbusiness-like way when in so doing he sacrifices what is not his. He is the salaried employe of a firm consisting of about eighty million partners. The official's actions should never be affected by outside influence. Why should the maker of this or the dealer in that lot of rejected supplies come to Washington with influential politicians to force the acceptance of their wares? Their friends do not claim to be experts in the manufacture of the goods? 'Ware of the man who tries to force his rejected supplies on the government through the influence of the political world! The naval officer who bends from the height where his faithful conscience places him, who bends one mite under such pressure deserves to be drummed out of the public service with louder taps than, say, the poor victim of minor moral weaknesses, that likely hurt only himself.

There has been instituted in recent years a system of penalizing merchants in time default under their contracts. The principle is sound; but the penalties at first were too large. Lately the latter has been realized and the amount of penalty reduced. But with this reduction came a letting down of the bars along the whole line of the penalty system, which has resulted in nullifying most of its good effect. Heads of navy yard departments having cognizance of belated supplies now certify to the general storekeeper, before the preparation of the public bills for payment, whether the government has suffered "damage" or "incon-

venience" by the delay. If damage or inconvenience is certified, the reasons must be fully set forth in writing by the head of department concerned, who must also assess the amount in dollars and cents of such damage or inconvenience,—this latter in spite of the fact that the penalty for delay, if damage or inconvenience is suffered by the government, is specifically stated in the contract. Upon these certificates the general storekeeper bases action as to stating penalty or not when he forwards the vouchers to Washington for approval. This leaves a wide range in which individual opinion as to the meaning of the words "damage" and "inconvenience" may have direct influence in affecting the pocketbook of the government or that of the merchant. A certain contractor may be penalized for delay in delivering certain articles, while with the same delay in the case of similar articles at another yard, or even in another department at the same yard, his bill may be paid in full, all owing to the difference of opinion as to what the words damage and inconvenience embrace. In the majority of cases the heads of departments solve the problem by stating that no inconvenience or damage has resulted from the delay; and experience has shown the merchants dealing regularly with the navy that such is likely to be the result.

The writer will admit here that he could take any ordinary case of delayed delivery of supplies and write an argument for the government on account of damage or inconvenience suffered and then, immediately after, without dropping pen, with a clear conscience, write an equally strong and convincing argument against the government exacting penalty in the case, on account of "damage" or "inconvenience." It all depends upon the construction of the term, which has never been officially defined, it is thought. There are cases now of heads of navy yard departments who invariably certify that the government has not suffered damage or inconvenience where supplies are belated, and there are other heads of departments who in every such case certify that the government has suffered damage or inconvenience, all, presumably, acting according to the dictates of their consciences. But think of the merchants and what they must think of us,—especially those who bid honestly on the time limit laid down in the specifications and gauge their prices accordingly.

Such methods can hardly promote healthy business with the navy. The question of damage or inconvenience should not enter

in at all. The penalty regulations should be laid down in fast black on enduring white, the exceptions, such as, acts of God, strikes, etc., standing out so clearly that there will be no dark places to hide behind or be hidden behind; and then no one under the secretary of the navy allowed to remit a penalty justly incurred. As it stands, it would be better to abolish this element entirely, in order to promote the dignity of the naval establishment and its standing in the higher commercial world.

CO-ORDINATION.

The relation of the purchase officers to the officers using the supplies and material is a subject requiring grave thought. The principle of having a special corps of officers for purchase and general store work is sound from the standpoint of both economy and efficiency. From the writer's view this is unassailable by honest argument. It is realized that all concerned will not agree with him, but the limits of this paper will not admit the details of an argument to meet supposed differences of opinion. The theory that the person who knows most about the quality of what is wanted, and the use to which it will be put, should do the buying is a plausible one and enlists the favor of those who would decide upon business methods by their emotions, and not by analytical study, with a sound reason recorded for each step. The economic elements involved compel the centralizing of the purchase business and the care of the records thereof.

But there are others than the purchase officers closely connected with buying. They are the officers who require and are to use the supplies or material; the general storekeepers who receive, keep and issue the stores, and with whom lodge the main records of the requisitions, the fulfillment of the contracts, and the payment of the bills; and the officers in military command where the purchases are made. All these officials being parts of the purchase machinery, it is most important to have healthy co-ordination and the lines of communication straight and swift.

It will be well to notice here a spot in the progress of purchase where time is frittered away, and therefore money lost. In many cases, after a contract is entered into or an order placed, there follows much correspondence before the business is closed. This should lodge where most of it does now,—in the general storekeeper's office, where the record of a purchase starts with the basis

of the requisition itself. But what a mass of useless stuff lodges there, and what useless copies of the same stuff lodge elsewhere! Duplication of papers and superfluity of signatures are at least two of the sins of commission to be charged to the present system. Formerly, the commandant placed his signature on nearly every paper that came into or was made in a navy yard. In recent years, owing to a little intelligent study, his task has been somewhat reduced. He still signs his name daily dozens of times where it is to no purpose whatever in a business sense, and in many cases, where he can have no knowledge of what is stated on the paper and where the paper would accomplish its mission just as well with his signature left off. This is the survival of the old military methods that cannot stand much longer against common sense business demands. In half the cases that now require a formal endorsement slip, carefully typewritten, signed, numbered, and copied, the initials of the interested officer written under a dating stamp on the back of the paper would suffice. Again, a general storekeeper receives daily from merchants many letters in regard to the purchase business under contracts and requisitions. Numbers of these require action by heads of yard departments. Under the regulations the general storekeeper must affix an endorsement slip to each such letter and send it to the commandant, requesting reference to the head of the yard department concerned. The commandant affixes another endorsement slip referring it to the head of department; the head of department affixes a third slip giving the required information and returns the correspondence to the commandant; and then the commandant attaches a fourth endorsement (his second in the case) and returns the paper to the general storekeeper. A waste of typewriting labor and stationery, a useless enlargement of the public files, and two unnecessary signatures of the commandant; but above all, a waste of time in accomplishing the act of purchase. It all boils down to an inexcusable waste of public money and the impairment of efficiency. A military commander's duties are not properly of the nature of many of those placed upon him by the present business organization. When the machinery is running smoothly it is not necessary for him to take a hand, but when there is a clog, a failure to respond, then comes in his real duty as a military head; then reference is made to him; then he sees papers and studies them; then he decides and directs; and then his signature becomes very necessary.

THE ECONOMY OF THE NAVAL SUPPLY FUND.

If Congress can be induced to enlarge the naval supply fund from its present inadequate amount to a working sum, there will ensue great economy in administration and the general efficiency of the service will be promoted. Aside from the fact that an adequate fund will make possible a genuine, business-like *general* store system (which has not existed), it should be borne in mind that it will lower to a perceptible degree the expense of administration. Starting with the natural decrease in the number of open purchase requisitions, there will follow a decrease in other related papers. Supplies will be bought in bulk to meet the demand of all consumers during a range of time from six months to a year. One ordinary "Request" of a general storekeeper for supplies to be purchased under the fund would represent, if the fund did not exist, dozens of open purchase requisitions, prepared in the various yard departments. Each one of such requisitions entails about the same expense on account of administration as the one large request of the general storekeeper for naval supply fund stores. It will not be difficult for even the layman to appreciate what the immense saving would be were the amount of the fund adequate to cover all the supplies and material, not purely technical in a naval sense, that should be kept in store to meet ordinary demands. The fund is now $2,700,000. It should be at least three times that size. When Congress can be convinced that the enlargement of the fund is not an appropriation of money, and that it does not mean a power to overstock any more than the annual appropriations do, the increase will be made. The Navy Department should not tire in its efforts to convince Congress on this score. The writer wishes he had room in this paper to try to prove that were the fund increased to a working basis, were the yard departments then prohibited from requiring under open purchase requisition at any time of the year under any circumstances articles carried under the fund, *and were the regulations limiting the drawing of supplies from the general stores to the immediate needs of specific jobs strictly enforced,* there would result a decided decrease in some of the annual appropriations and a decrease in amount of stock carried.

INSPECTION OF SUPPLIES.

An element in the purchase system that must be particularly noted is the board for the inspection of supplies and material delivered from purchase. As originally organized, about eighteen years ago, when the general storekeeper system was established, and as administered for some time afterwards, this board was a great factor for efficiency and honest administration in purchasing. It might truly be said that its establishment was a reform in naval administration. Since its early days of usefulness it has gradually degenerated in value as a good point in the system, until today it is not only practically useless, as administered, but an actual encumbrance, an unnecessary expense as to time and money,—a cause of inefficiency. The theory of the board's organization was this:—that at each navy yard the purchased supplies should not be accepted for use and paid for until a board of three experienced commissioned officers had passed upon them as to both quality and quantity; the board to be independent of yard departments, as such, and of the purchase officer and general storekeeper. The senior member and one other were to be permanent, and have no other duty, and the third member, an officer temporarily appointed from the yard department having cognizance of the material under inspection. The following requirements were in the regulations at the beginning and are there today:—

When supplies are received, general storekeepers shall immediately call for an inspection of them, and it shall be the duty of commandants to see that boards of inspection pass upon them without delay.

For the inspection of supplies submitted for delivery there shall be at all navy yards a board of three officers, to be appointed by the commandant, two as permanent members and the other as the representative of the bureau to which the supplies pertain.

The board shall carefully inspect as to quality and quantity, and nothing shall be passed except by unanimous approval.

After noting action on the call, the board shall return the original to the general storekeeper, forward the triplicate to the head of department to which the supplies pertain, and retain the quadruplicate. The duplicate, accompanied by a summary, signed by the senior member, shall be forwarded daily to the Bureau of Supplies and Accounts.

In the 1905 edition of the Navy Regulations appear the following, *in addition to what has just been quoted:*

Upon the receipt of the official notification that articles intended for his department are ready for inspection, the head of the department concerned,

or some person duly authorized to represent him, will go to the storehouse and make the required inspection, and a definite report will be sent into the office of the board of inspection.

In case (of) tests . . . . . a special report thereof shall be made through the senior member of the board to the commandant.

The chemist and others from whom expert or technical assistance is required by the board will submit to the board a daily report (of progress). . . . . .

Weekly memoranda of outstanding inspection calls shall be sent by the general storekeeper to the heads of departments concerned. . . . . .

These regulations are quoted in order to show into what a chaotic state the matter of inspecting supplies has drifted. A careful comparison of the 1905 addition to the regulations, just quoted, with the requirements still standing (also quoted) is requested. The confusion in directions will be quite evident. The connection of the head of a yard department, as such, with the board's work is not recognized in the older part of the regulations. There it is stated that the board, as such, shall inspect as to quality and quantity. Later on, in the 1905 edition, it is instructed that the inspection shall be made by an *individual*, the head of the yard department concerned or some authorized *person*. Heads of departments may carry on tests and make reports at the same time chemists and other experts are carrying them on and making direct reports to the board. Confusion, nothing but confusion. As stated before, for years there has been a gradual retrogression in the importance of the board's duties, in spite of the regulations in force, and the work has drifted almost entirely into the hands of the yard departments. Practically, no inspections nowadays are made by an inspection board of three officers, and many are not made by any officer at all, but by some authorized *person* instead. But the board is still left standing as an expensive official nuisance. Today, at one important yard the two permanent members of the board of inspection are the paymaster of the yard and a retired mate. These officers sign all the inspection reports, passing or rejecting supplies, but they never see the articles, except by accident. Their signatures are valueless. All the records of the inspection board's office are worth no more than attic junk.

Thus, after nearly a score of years trial, the board of inspection in practice is acknowledged as being "not wanted." The writer has always been a believer in the theory of it, and would like now

to see the board rehabilitated in its old power and usefulness. It is hard to make concessions from what seems to be sound business policy, that so well protects the interests of the government and the merchants dealing with it. But the application of the theory for many years has been in the hands of the most faithful and conscientious servants the government has,—its naval officers. After the long trial, they have refused to have the board of inspection as a power, and it is thought that that will have to settle the matter. The regulations should be made consistent and the expense of the now practically useless boards saved. The board of inspection as originally organized was one of the strong bulwarks against fraud in the purchase and general store systems. As it is administered today it is no such check. Common sense dictates the doing of one of two things without delay; either restore the boards of inspection to their old time usefulness and power or abolish them.

CONTRACT AND OPEN MARKET PURCHASES.

The law in regard to purchasing supplies for the navy is as follows:—

> All purchases and contracts for supplies or services shall be made by advertising a sufficient time previously for proposals respecting the same, when the public exigencies do not require the immediate delivery of the articles or the performances of the services.

The intent of the law is obvious. The law makers expected the navy to keep itself supplied ordinarily with supplies and material purchased after advertisement and the receipt of sealed proposals, and by "exigency" was undoubtedly meant a condition that the forethought of an intelligent and experienced mind could not have prevented. Too often emergency requisitions are made necessary by the absence of the commonest kind of forethought. Upon this point the service has been subject to periodical attacks from the auditing officers of the Treasury; and at present it is suffering from the worst attack of the kind known to living man. The law should leave the style of purchase entirely with the secretary of the navy. The heads of the executive departments of the government are among the highest officers of the land. They must be trusted just as the President and the justices of the supreme court are. These men are too prominently in the view of all who care to gaze to permit of wrong-doing on their part for any damaging

length of time. Continued abuse of the law on their part would soon become notorious, and the administration would look out for them if no one else did. With an isolated exception here and there, since the government was established, our cabinet officers have been gentlemen of the very highest reputation for unswerving honesty. Some of them have gone into obscurity under a cloud, but such has generally been due to their lack of executive ability.

The paymaster general, in his annual report for 1902, after quoting the law on purchasing (R. S. 3709), writes as follows:—

> This law, enacted more than forty years ago, permits no departure from advertising for supplies or services save when immediate delivery or performance is required by the public exigency. Strict compliance with this law often entails expense and delay that are unnecessary and vexatious. The conditions of business have materially changed since 1861; and while the principle of buying under public competition remains as sound now as then, there are large classes of supplies for which competition can be obtained as well at open purchase, after inviting bids, as by the expensive and time consuming process of advertising. The effect of large industrial combinations is in certain lines of business to make prices uniform, and agents are often under penalty not to sell below the rate as fixed by those controlling the market. In such cases the government has much to lose in time and expense by the slow process of advertising. On the other hand, by buying at open purchase, by publicly posting projected purchases in the purchasing offices and sending written proposals to dealers for filling in and return as formal bids, the principle of competition is preserved and the rights of all legitimate business men to strive for public business are observed.
>
> The Bureau recommends, therefore, that Section 3709, R. S., be amended by adding the following:
>
> Provided, That if the delay incident to advertising would be detrimental to the interests of the public service, purchases may be made after public competition in the open market, in the discretion of the proper administrative or executive officers, when in their opinion, considering the cost of advertising and the conditions existing at the time, equally or more advantageous terms can be secured thereby than by public advertisement in the newspapers, or when the amounts involved are small; and proprietary articles which, by their nature, are barred from general competition, shall not be subject to advertisement.

This recommendation was renewed in the report of the paymaster general for 1903.

The sooner such a change is made in the law the better. The present situation at the navy purchase offices, enforced by recent decisions of the treasury in regard to the necessity of formal contracts, is almost intolerable,—would be wholly so for

any other than government officials, who, after all, have simply to obey and let the government take the consequences.

Even under the change of law there would continue to be bought by advertisement and under formal contracts the great bulk of naval supply fund stores, provisions and clothing, electrical material, ordnance supplies, etc., which it is thought would amount in money value to ninety per cent of the total expenditures for supplies. But the change proposed would remove a hamperment that need not exist; and the efficiency of the purchase department would surge forward to a very perceptible degree. There would be no more fraud nor higher prices paid than in the past, and there would certainly be a great saving of money in the cost of administration.

ADVERTISING FOR SUPPLIES.

Under Section 3709, Revised Statutes, the length of time for the publication of advertisements inviting proposals for furnishing supplies was left somewhat to discretion; but the Act of July 5, 1884, (23 Stat. at L. 109) fixed in all cases, excepting emergency purchases, the minimum period during which public notice shall be given. It authorized the purchase of "small amounts for immediate use," after public notice of not less than ten days, while all other purchases are required to be made after public notice of not less than *thirty* days.

In this age of live and watchful business men, notice of thirty days is not necessary for obtaining healthy competition. This old law adds materially to the cumbersomeness of purchasing by advertisement and promotes neither the interests of the government nor those of the business community. It should be amended so that advertising for a period of two weeks would be all that is necessary in any case. No legitimate business man requires thirty days in which to make his proposal, for he will always wait until the last moment to submit his bid, on account of the fluctuations in market prices.

BONDS, CERTIFIED CHECKS AND GUARANTIES.

The laws in regard to bonds and other guaranties to be furnished by the contractors make such a bad point in the purchase system that they form a huge stumbling block in the road to efficiency.

Up to 1896, a bid from a prospective contractor had to be

accompanied by a written guaranty that he could fulfill the terms of the contract, and the contractor to whom award was made had to furnish, in addition, a bond for the faithful performance of the contract. The amount of this bond was not fixed by law, but in practice it ranged from 25 to 50 per cent. The bond business was naturally irksome to the merchants doing much business with the government, and so, the Navy Department realizing this finally, an effort for a change in the law resulted in the passing on May 25, 1896, of an act authorizing the secretary of the navy in his discretion to accept in lieu of the written guaranty and the formal bond a certified check for the full amount of the proposal and contract. But there was no remedy in this change. No sane merchant entering into a large contract cares to tie up cash in the form of a certified check for the full amount of his venture. The new act gave no relief and was most unfair to the business community. The amount of the certified check should have been left to the discretion of the secretary of the navy. If it had been, it is not likely that it would ever have exceeded 50 per cent, as in the case of bonds, and it is quite likely that in very many cases it would have been as low as 10 per cent, and placed at that low figure with perfect safety to the government.

Ever since the Act of 1896, the paymasters general have made earnest effort to have the law amended in regard to the amount of the certified check, but so far their efforts have not succeeded beyond the actual introduction of the proper bill in Congress. An effort has also been made in recent years to have a law passed allowing merchants dealing with the navy regularly, who wished, to file with the department an annual bond, in amount as fixed by the secretary of the navy, to cover any undertakings during the year, and to take the place of guaranties, individual contract bonds, or certified checks. The writer is not quite in favor of the annual bond scheme, but acknowledges himself still open to argument.

The present unjust laws on this subject keep more reputable men from dealing directly with the navy than any other bad point in the purchase system. Here is a good example of the arrogance of the government as a buyer of goods. No wonder the navy gets the door of many a business house slammed in its face when it goes out into the market. So suffers efficiency: so grows the sum of the government's bills.

PAYING FOR SUPPLIES.

The navy's method of settling its bills drives many merchants from the field of direct competition. It is mostly slow, cumbersome and unjust. The interest on money is too important a matter in the commercial world not to have its effect here. Often the result is prices above the market rates or quality below what is bid on.

The slowness in settling the bills is caused by the delays in inspecting the supplies and the time consumed in the operations of preparing and afterwards handling the public bills or vouchers and the drawing of the requisitions on the Treasury Department for funds with which to pay. Some of these operations are too solemnly slow and dignified for good business, and the government operators are too independent, for equity's sake, of the merchants.

The merchant should not be made to suffer through unnecessary delay on the government's part in handling the business, after he has satisfactorily completed his contract or the order placed with him by a purchase officer. The delinquent contractor is assailable, in a money sense, from the government's side, as has been stated in this paper in the reference to penalties. Why then should not the delinquent government be accountable in a pecuniary way to the merchant who has satisfactorily completed his contract? In every contract should be entered the stipulation that if the government fails to settle with the other party within a stated number of days from date of a satisfactory delivery that completes a class of a contract, or the whole of an order under an open purchase requisition, there will be an addition to the prices paid at a certain per cent for every day of delay beyond the stipulated time. Every voucher with such increased prices, caused by the government's delay in settling, should be accompanied, when sent to Washington, by a report from each office in which the business is handled from the hour of the delivery of supplies at the general storehouse, giving dates, periods of time, and explaining in precise terms the cause of any delay. There would likely ensue some changes in the personnel of an office in which a succession of such delays occurred. The time limit would not be the same for all contracts. In the case of supplies requiring a protracted test after delivery, the allowance would be greater than in the case of ordinary material requiring no extended examination to determine quality.

The delay caused in getting money requisitions through the Treasury Department has been avoided to a certain extent in recent years by allowing purchasing pay officers to keep on hand a limited amount of funds under "general account of advances," and to pay out of those funds, so far as possible, approved public bills immediately upon their receipt, crediting the account later when money is received in due course, under the regular requisitions drawn under the proper appropriations. With all the contract and some other kinds of bills now being paid at the navy pay office in Washington, there is no good reason why enough funds under general account of advances should not be carried by all purchase officers elsewhere to meet all demands upon them in the way of settling public bills.

Time could be saved and useless signing done away with in the case of public bills covering purchases made by purchase officers, under open purchase requisitions, by the bills being sent direct to the purchase officer from the general storekeeper who prepares them, then paid, and a copy of the bill afterwards forwarded to the Bureau of Supplies and Accounts. Forwarding such bills through the commandant of a yard and requiring him to approve each one over his signature is a waste of time. That officer knows nothing about the bills, and his signature, or approval, means nothing so far as efficiency or guarding the public interests is concerned. Here is another illustration of inefficiency caused by useless military forms entering into the business system. There is no good reason why time should be wasted in sending such bills to Washington for the approval of the paymaster general before payment. In such purchases the approval of the requisition by the bureau concerned and the order of the paymaster general to the purchase officer to buy are the committing steps. When the purchase officer receives the public bills with the general storekeeper's statement thereon that his order has been satisfactorily filled, settlement should be made at once with the merchant. A copy of the bill, immediately sent to Washington, gives the Bureau of Supplies and Accounts all the information necessary.

A bad point in connection with the payment of bills is the regulation in regard to lost checks issued by navy disbursement officers. The regulation as it stands is oppressive, most unjust to the creditors of the navy. Most bills are paid by check sent through the mails. Before the check is mailed the merchant concerned must

have placed in the disbursement officer's hands a receipt for the amount. There is question in the writer's mind as to the justness of this proceeding, but he will pass over it, for the reason that requiring the receipt before the creditor sees his money eliminates much irritating work of correcting errors and misunderstandings. But if the check does not reach the merchant to whom it is mailed, after he has formally acknowledged the receipt of the amount of it, he is obliged to wait six months before receiving a duplicate, and then only after giving bond for twice the amount of the check and making affidavit as to its loss. The " affidavit " has to consist of the statement that the disbursement officer issuing the check asserts that on such a day he mailed the check. How absurd! The serious matter is the wait of six months. The remedy for this point is within the control of the secretary of the treasury. The time limit for issuing a duplicate check should be reduced to thirty days. Many of these old regulations are way out of fashion in the present day's volume of quick business, made possible by instant communication with all parts of the world.

Statute law comes in to interfere more seriously in the case of a lost check of amount of over twenty-five hundred dollars. There can be no duplicate issued then. Instead, the merchant, who has been assured by the disbursement officer that on such a day he, after having obtained the merchant's receipt, mailed him a check, say for $10,000, must get a bill through Congress in order to receive his money. When business men first hear this they think it a joke. There should be no such law of limitation for issuing duplicate checks, and it ought not to require much effort to have it repealed. Until it is, disbursement officers should not be allowed to send through the mails, or by messengers, checks of amounts exceeding $2499.99. If necessary, they should issue several checks of that amount or less to make the total of the particular bill to be settled. In the case of exceedingly large bills a duly authorized agent of the creditor could receive the check in person from the disbursement officer.

There are many cases arising of lost checks, and the matter is worthy of serious consideration. In passing, it may be stated that when a treasury warrant is lost a duplicate may be issued by the Treasury Department after forty days have elapsed from the date of the original. There is a great difference between the six months for navy disbursement officers' lost checks and the forty days for the lost warrants of the Treasury Department.

HONESTY OF PURPOSE.

But with all the laws and amending of laws, with all the reforms and studied organization, nothing will avail unless we have the constant honest endeavor, the patriotic striving of the human element of the purchase and general store systems. Honesty, thoroughness, and constant endeavor will sow the seed of ability in the most barren soil, and in time, promote efficiency. Untruth, self-aggrandizement and laziness will never do such, but, on the contrary, will bring disaster both to the servant and that which he serves. The writer vividly recalls his acute boyhood disappointment whenever he passed into a side show at a circus. The fat woman never was a tenth the size she was depicted in her beautiful tarpaulin portrait outside, and there was nearly always equal disappointment all along the line. And there were some things pictured outside the tent that were not inside at all,—lies! He therefore in his very youth formed a poor opinion of side show managers. It is far better in our business not to hang pictures on the outside, and beat the drums to attract attention to them; but if we do, let us, above all things, have inside as much or even more than we paint on the outside.

It is hoped that time will bring opportunity for a discussion of the details of the principal points mentioned in this paper, for the benefit of those particularly interested in the technical matters involved. It is also hoped that the writer has performed his self-allotted task in a non-partisan spirit, and not from the view point of an ill-regulated enthusiast. He certainly realizes that to work successfully toward the perfect the young and the old must lie down together, and the strong, youthful maw should not crave to eliminate the intellectual power of age and experience.

DISCUSSION.

Naval Constructor T. G. ROBERTS, U. S. Navy.—This paper is very timely indeed, and covers a field where enlightenment is of greatest need at the present moment, from a source so well represented by its author; and I wish to subscribe in the beginning to the justness and the merit of the author's conclusions, which ought to be taken up at once by those in authority with a view to amending the laws governing the purchase of supplies. The evils of the system are not due to any human in the toils of the system, but to written laws on the statute books, and written regula-

tions in the Blue Book, and it is folly to suppose that any grade of human beings placed in the toils of red-tape begotten by chaotic laws and regulations, could either remove these laws or be permitted to violate them. That being the case, I must express the fullest confidence in the ability of the purchasing paymaster who, like other naval officers, is far removed from outside political influence in expenditures, or enrichment by graft. In no branch of the government where funds are disbursed has the record been cleaner than that of the naval paymasters; and in war no ship was ever found lacking in supplies. I would therefore not lay so much stress, as the author, on the detail of administration, which consists of selecting the right man for the right place—A condition which must be met in every corps of every navy everywhere; but would prefer to remodel and perfect the system, rendering it sufficiently fool-proof to be automatic in the hands of the poorest administrator liable to occupy the chair in the ordinary run of events. In doing this I would differ from the author only in one essential feature, and that is in the administration of the general storehouse of a navy yard, which is, or ought to be, a thing apart from "The purchase system of the navy." It is one thing to purchase supplies for the navy, it is another thing to receive navy yard stores and serve the industrial departments with them. It is still quite another thing to receive fleet supplies at a navy yard and serve vessels in commission with them. These three subdivisions are not arbitrary or theoretical, but are due to the nature of things, and must be borne in mind to evolve order out of chaos. The practical considerations which govern them are simple enough when one is familiar with them. I have said in previous writings "Consolidation of yard storehouse with the single yard department is the only salvation," and this one department "should have cognizance of its own materials so as to control the economy in their purchase and handling." I do not mean that it should purchase materials —far from it. The purchase of materials is most ably encompassed by the author under the following subheads:

Government Purchasing Distinctive from Commercial Trading.
The Field of Competition.
Delinquent Contractors.
Contract and Open-Market Purchases.
Advertising for Supplies.
Bonds, Certified Checks, and Guaranties.
Paying for Supplies.

These are the matters which properly belong to the duties of purchasing paymasters.

A fleet storehouse located in the navy yard should be kept by a paymaster who would order, receive, inspect, and issue all fleet stores, such as coal, provisions, clothing, small stores, and perishable stores forming the allowance lists of vessels. These stores are standard, their use is regular, constant, and certain, and the kinds and quantities may be estimated in advance with a certain measure of exactitude. Therefore a stock may be accumulated, even under present laws and regulations, a

long time in advance with a reasonable certainty of its being used in due time. To accumulate this stock, funds are needed, and this I should consider to be the true mission of the naval supply fund.

The construction and repair storehouse should carry navy yard materials, which are different from, and more varied than, fleet stores. Furthermore, it is wholly impossible to foresee the need of repair materials in advance, for the simple reason that no mortal under the sun can tell what repairs may turn up tomorrow requiring materials unforeseen. Nothing in the world combines such great quantities and varieties of materials as a modern ship of war, and no one can foresee what portion will next need repairs. Under present laws and rulings a yard department is ordinarily removed several months from obtaining such unforeseen materials, which necessitates a large stock of great variety under the naval supply fund, much of which may not be used for many years, though it might at another yard be needed at once by unexpected repairs. The law should be amended without delay. The merchants have so organized in these modern times that, as a rule, an open purchase requisition at short delivery will obtain the same bidders and the same prices as if advertised at six months' delivery. The difference in price in any case would not be great and the total saving to the government in time and money would be immense. It is expensive to maintain the laboring forces while waiting for materials.

The yard storehouse should, of course, carry a certain stock of standard materials, but the great bulk used in the construction and repair of vessels, the most legitimate output of a navy yard, which must be determined *after* the preparation of surveys, plans, and specifications, should be obtainable at once—directly, by telegraph if advisable—as in a private shipyard. Of course there must be safeguards and signatures to papers, but why exact many signatures and many copies of papers covering a transaction where one will locate responsibility? The government must, in the last analysis, reply upon the honesty of individuals, and there is no graft in the commissioned personnel of the navy.

A ship arriving at a navy yard for repairs is an event. A "sea want" (to quote a distinguished officer) has arrived. A sea want is one hard to get rid of until it is out of sight. The work must be done immediately, if not sooner. The men and the materials must both be on hand, and no excuses will be accepted. To do this under present laws and regulations, you must maintain a standing laboring force and a large stock of materials under the naval supply fund, for in no other way can the present system meet the demand. If you wish to economize in labor, consolidate into one yard department thereby substituting the framework of a single organization in lieu of several, and dispense with clerks preparing transfer papers in ordering, receiving, inspecting and expending materials by placing the yard storehouse under the direct jurisdiction of the single yard department. To accomplish this is no revolution, nor is it a material change from existing methods, considering that the *actual work* involved is now done by the industrial department, as it would be then. The change cuts out all duplication of clerks and paperwork. But if you

wish to reduce the stock in naval supply fund, amend the laws so as to provide purchase at short notice. Otherwise, under the present arrangements, Congress should appropriate more money for a larger stock in naval supply fund, for in no other way can the navy yards be in a position to undertake immediate repairs in peace or war, or to employ economically its labor while conserving, at the same time, its force of skilled mechanics. The penny-wise purchase of materials at long range is father to the pound-foolish maintenance of the working forces while waiting for materials.

The purchasing paymaster effects the purchases and his work should be facilitated by amended laws and regulations as explained by Pay Inspector Mudd, but the navy yard controls the main economies in the purchase and handling of materials, and it is the main factor in making the returns affecting the time of payments. Contractors are required in practice to deliver goods at such point of a navy yard as shall be determined, by the department concerned, at delivery. In many cases contractors, anywhere up to three thousand miles away, have to engage local agents to complete deliveries beyond the end of regular transportation lines, even though the lines should touch some other point of the yard. The requirements vary with the various departments. The unforeseen extra cost, and the delay of completing deliveries, is borne by the contractor. After years of experience, at established yards, government contractors boil down to a certain few constant bidders; they know the uncertainties of deliveries, and they add a margin of profit in their bids covering these contingencies. They also add a margin covering contingent delays in payment owing to the uncertainties of inspection and returns. Thus the government pays more for its goods. If there is any doubt about this, let the government take the testimony of its main contractors during the past few years. With a single yard department controlling its supplies, a simplicity and uniformity in these matters would be established inevitably, and it wouldn't take the contractors long to find it out. In this way the yard department could control infinitely more economy in the purchase of materials than a purchasing paymaster could ever hope to do.

The above comprises, in the main, what I wish to add in discussion, but will refer for diversion to some minor points in the paper. On page 89 the writer says, in italics: "Were the regulations limiting the drawing of supplies from the general stores to the immediate needs of specific jobs strictly enforced" there would result great saving, etc. To make a long story short, it would do the opposite. An incident worth relating happened several years ago. As a member of a navy yard board I helped lay down the above requirements advocated by a certain paymaster, in an official report to a commandant regarding some missing stores. The recommendation went into effect and the yard departments received orders accordingly. Perhaps the author may remember the incident. It was my first navy yard effort, and I knew nothing of the storehouse system nor of the C. & R. department system. Afterwards, Naval Constructor Bowles asked me why I had thus interfered with his work, by acting without consulting him or some one who knew something about it. I felt highly indignant. But now the thing is plain as day,

and it won't do. An independent storekeeper, exacting compliance with impracticable rules, reacts by clogging the wheels of the organization delivering the yard output in work accomplished.

The navy regulations require the thing to be done by the above rule, but it isn't done that way anywhere, I imagine, no more than the inspection board is governed by the rules in force. Why? Simply because the rules are impracticable. Yet the author would not only enforce this rule, but would resurrect the comatose inspection board. To effect improvements you must work along the lines of greatest facility and practicability, not directly against them.

A storekeeper subordinate to the head of the industrial department would be in a position to have his efforts co-ordinated and made subservient to the accomplishment of results. The author of the paper recognizes, as does every one else, the lack and the need of coordination at navy yards—likewise we have read much of the need and the lack of coordination among the bureaus of the navy department. Why? Why is it that coordination does not exist in the oldest, no more than in the youngest navy yard? Why is it that no isolated case exists of the proper coordination? It is because, in the nature of things, the organization renders coordination impossible, irrespective of individuals. The remedy is reorganization and consolidation, and I have advocated the French system as the most direct, logical and business-like of any in existence.

I have previously pointed out in general terms how this can be accomplished. Let me particularize further. It is a matter of administration more than of law. Law is inflexible and can not be changed to suit changing conditions in naval administration, which is necessarily a continuous development. The minimum of law and the maximum of executive latitude is required. Thus:

LAW.

1. An act modifying section 419, Revised Statutes, by abolishing the bureaus of steam engineering, equipment, and yards and docks, to take effect as expediently as the Secretary of the Navy shall determine.

NAVAL REGULATION, BUREAUS.

(*a*) The Bureau of Construction and Repair to have cognizance of navy yards, yard stores, and naval vessels exclusive only of ordnance and ammunition.

(*b*) The Bureau of Ordnance to have cognizance of ordnance, ammunition, and their appurtenances, but not armor. Its duties shall end with procurement, transportation and delivery to a navy yard or shipyard.

(*c*) The Bureau of Navigation to take over all items of defunct bureaus not included above.

(*d*) The Bureau of Supplies and Accounts to be as now, excluding the navy yard storehouse.

(*e*) The Bureau of Medicine and Surgery to remain as now.

NAVY YARD REGULATION.

1. A commandant of personnel, exercising military control over a navy yard or station.

2. A department of Construction and Repair, exercising control over the manufacturing and repair operations and the stores in connection therewith, including the employment of labor. Its head to be a skilled naval constructor, responsible directly to the Bureau of Construction and Repair for the quality and cost of the work. Its official personnel to consist of line-shore-duty engineers, civil engineers, naval constructors and assistant naval constructors, all junior in rank to the head. Correspondence and papers relating to its internal administration shall travel direct to destination, not through the commandant. The commandant to control it, as a military unit, by such orders as shall proceed from the Secretary of the Navy. All investigations and discipline of its operations and personnel to be determined by boards or courts, composed of officers on like duty under the Bureau of Construction and Repair, under the usual directions of the commandant and other military authorities.

3. The balance of a navy yard or station to be as now, with the introduction of a fleet storehouse under a paymaster.

SHIPYARD REGULATION.

1. A line-shore-duty engineer in charge of machinery and boilers. A naval constructor in charge of hull and appurtenances. Assistants in kind in each branch to suit the needs. Such line and other officers assigned as inspectors in connection with the turning over of the completed ship to the Bureau of Navigation, to be assigned by the latter bureau—the same to obtain at a navy yard.

THE CONSTRUCTION AND REPAIR PERSONNEL.

To be composed for present purposes of the non-seagoing corps, consisting of naval constructors, line engineers and civil engineers; to be recruited in future by assistant naval constructors qualified in naval architecture and marine engineering, as in the French navy yards. Civil engineers to be assignable to duty under any bureau. Such line and other officers to be assigned for such duties as the Secretary of the Navy shall deem advisable.

ARGUMENT.

The above program endeavors to adopt the French system, while utilizing and conversing the interests of the present personnel, the nature of whose present duties are not changed. By recruiting into the corps of naval constructors the French corps of constructors will be, ultimately, duplicated; and such a course will provide a homogeneous body not split up by jealousies caused by a difference in rank, corps or pay. In providing for line engineers the juniors may be assigned to navy yards where engine building and designing engineering is at a minimum, and

the seniors to shipyards and other posts where boilers and engines are being built and designing engineering knowledge is essential. The Bureau of Ordnance must remain intact, if only as a nursery for perpetuating the science of guns and ammunition. The manufacture of guns and ammunition is distinct from installing them on shipboard. Congress could not afford to risk an inferior article in these lines.

FINAL.

The author of the paper under discussion will, no doubt, wonder why I have detailed all this in a discussion of the purchase system of the navy. It is because a new plan will not be adopted unless it can be seen how the details are going to work out. It is also because the purchase system exercises such a large influence in navy yard administration that it is futile to consider remedying a part without considering the whole. The storehouse system is wrapped up in every detail of navy yard work. If you do not reorganize the whole, you can do little in ameliorating the part. Even the detail of abolishing the Inspection Board would be insignificant. You cannot cure a cancer by treating the symptoms.

Paymaster CONARD, U. S. Navy.—In suggesting remedies for the present unfortunate state of affairs in the business of purchasing, it is necessary to draw a sharp line between those conditions which result from the application of statute law and those which result from departmental and other regulations.

In the first case, any change desired must be procured through congressional legislation, at all times a difficult matter to put through, and especially so when the apparent object of such legislation is to render easier the expenditure of public funds by removing "safeguards" which Congress has instituted in former times. In the second case, we have to deal with such rules and regulations as have been instituted by the departments of the treasury and navy, due to the interpretations by the officers of those departments of the existing laws. It is a far easier and more hopeful task to submit arguments and suggestions relative to these regulations, with a view to possible changes, than to suggest amendments to the law, since, when a clear case can be made out, the desired remedy will naturally follow as a matter of course. And although such remedy may only alleviate, and not cure the existing evil, it is believed that the effort is worth while, and that the relief obtained will help to point out the benefits to be secured by a complete cure, in the form of new legislation.

The law requiring *newspaper* advertising, with its attendant formalities, is found in section 3718, R. S. This section, and those following it, indicate the procedure for purchasing *all* the material (except certain supplies mentioned in a succeeding section) for the use of the navy, *when time will permit*. This last is certainly the saving clause, and allows room for the suggestions I intend to make. The latter part of section 3709, not quoted by Pay Inspector Mudd, reads:

> "When immediate delivery or performance is required by the public exigency, the articles or service required may be procured by open purchase or contract, at the places and in the manner in which such articles are usually bought and sold, or such services engaged between individuals."

Certainly noting could be more obvious than the intent of this law, as Pay Inspector Mudd shows in reference to the portion quoted by him. By "public exigency" I do not think that "emergency" alone was meant. For while all "emergencies" would probably constitute "public exigencies," there are many cases in which public exigency requires immediate delivery or performance, in which there is no question of an emergency, in the sense of lack of forethought, or unusual conditions. And I believe that it is this sort of public exigency to which the statute was really intended to apply. On the other hand, where emergency requisitions are made necessary by the fault of some one concerned, the proper procedure would seem to be to punish that individual for his fault in a fitting manner, but not to penalize the government by refusing approval to the requisition, provided "immediate delivery or performance *is* required by the public exigency."

The act of July 5, 1884 (23 Statutes at Large, 109), refers entirely to purchases for the army. But even should it be held to apply to the navy, it does not prohibit purchases in a sane manner, when the public exigency requires immediate delivery or performance.

There is another statute to which it is well to call attention, reading as follows:

> "It shall be the duty of the President to make, subject to the provisions of law concerning supplies, such regulations for the purchase, preservation and disposition of all articles, stores and suppplies for persons in the navy as may be necessary for the safe and economical administration of that branch of the public service." (Section 1549, R. S.)

This last quoted law brings me to the point I have had in mind, which is: The President should "make, subject to the provisions of law concerning supplies, such regulations for the *purchase*—as may be necessary for the safe and *economical* administration" of the navy. Thus, the result sought by the paymaster-general in his recommendation in regard to amending section 3709, R. S. (Annual Report 1902 and 1903), might well be attained by an executive order reading, in a general way, as follows:

> If, in the opinion of the proper administrative or executive officers, the delay incident to advertising would be detrimental to the interests of the public service, or if the amounts involved are so small that, considering the cost of advertising, equally or more advantageous terms could be secured by public competition in the open market, such conditions constitute a public exigency requiring the immediate delivery of the articles or performance of the services, in the manner prescribed by section 3709, R. S.

If such an order were issued, under the sanction of section 1549, R. S., it is believed that the Comptroller of the Treasury would give to it its due weight as an administrative measure.

As regards the naval supply fund, it is true that the amount is now far too small. But much might be done if methods of handling were improved. In the first place, the entire amount of the fund should be in stock. There should be no *unobligated balance*. What would be thought of a business firm which allowed part of its capital to lie idle? Then, the yard departments should now be prohibited from requiring for, under any circumstances, articles carried under the fund. It will be at once objected that the fund is not large enough to carry *all* the articles needed, of which it now carries a part. True, it cannot carry all at the same time, but it *can* be turned over so fast that it can carry every item for a time. Coincidently with issuing the order that all articles carried by the fund should be obtained from the fund only, proposals should be sent out for supplies to cover the increased demands from the yard departments. Contracts would ensue which, in the aggregate, would far exceed the value of the fund. But the payments would fall due at different times, and the increased issues at the yards would be constantly causing the transfer of money back to the fund. The fund, regarded as a balance wheel, would simply revolve faster and faster. Should the rate of purchase at any time run ahead of the rate of issue, it would simply be necessary to transfer a sufficient quantity of stock in block from the fund to a current appropriation, one which would be certain to use the amount transferred within a month or two anyway. In this way the amount of stock on hand at any one time would never exceed the value of the fund. The fund would simply represent a large reservoir, into which streams of equal volume were entering and leaving. The success of a business is not dependant solely on the amount of capital involved, but on the rapidity with which that capital is turned over.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE CIVIL AND THE MILITARY AUTHORITY.

By Commander Bradley A. Fiske, U. S. Navy.

It is a common saying that, in the United States, the military is subordinate to the civil authority. But, in every civilized country, the military is subordinate to the civil authority; that is, to the central authority of the government. In every civilized country, including our own, the Sovereign is the chief of every department; and our own President is as much commander-in-chief of the army and the navy as is the Emperor of Germany or the Mikado of Japan—but no more so.

The functions of every civilized government are manifold, and include the control of its military forces. It is impossible even to imagine a contrary condition: it is impossible to imagine a state of modern civilization in which the military would dominate the civil authority. It is true that during emergencies, martial law has sometimes been established; but, even in this respect, we do not find our country different from others, for martial law has often been enforced within its borders.

Yet, when we compare the importance which the military authority has, in this country, in time of peace, with the importance which it has in other countries, in time of peace, we find that it has very much less importance in this country. Of course, the simple reason is that this country has never had a serious foreign war since the Revolution, and has never had to develop the military arts: it has been allowed to grow to maturity far away from other countries and undisturbed by them; whereas other countries have grown up close together, and have had to be fighting, or getting ready for fighting, most of the time. In this respect we have grown up in luxury, like the son of a millionaire.

But the time comes, even to the son of a millionaire, when he must put on the armor of manhood, or decide to dawdle away his life. Perhaps this time has now come to the United States. We have already decided not to dawdle, but to take part in the world's struggles. Shall we have to put on a little armor? Every other nation has had to do so. If so, we may not need very heavy armor; but it is clear that the armor should be good. We may not need a very big army and navy; but it is clear that they should be good.

In order that they may become good, the proper means must be allowed. The first means is the correct application to the army and navy of fundamental military principles. If these principles be mastered thoroughly by the civil authorities, and if the proper application of the principles be understood by them, and if the conditions to which the principles are to be applied be perfectly clear to them, then the army and navy can be perfectly directed by them, as were the army and navy by Napoleon. But if those principles, and the means and conditions governing their application, be not thoroughly mastered by the civil authorities, then common sense and all experience show that interference by the civil authorities with the military authorities should be restricted to cases in which other conditions besides military conditions have to be considered. That this is true, all history shows. History is full of the calamitous results of interference by civil officials with both military officials in council and commanders in in the field. Our own Civil War was prolonged by it; and the disaster that may come to us in the future is suggested by the celebrated cablegram to Dewey, giving him a flat order to capture or destroy the Spanish fleet. The cablegram was so expressed as to give him no discretion whatever, though he was twelve thousand miles away and about to confront conditions which neither he nor anybody else could predict! Only the unexpected and wholly unmilitary act of the Governor-General in making the Spanish fleet fight where Manila's guns could not support it saved Dewey's fleet from disaster. The cablegram would have been differently expressed, if it had been framed by a general staff.

It seems improbable that the civil authorities of this government will ever be able to get the time to devote to the study of military principles and conditions which is needed to master

them; and yet it is clear that nothing short of absolute mastery can suffice. "A little knowledge" may not be a very dangerous thing when possessed by a mediocre man; but when it is possessed by an official of ability and force, it becomes a menace to the State. Alexander, Caesar, Peter the Great, Washington and Napoleon were all able to direct the military as well as the civil departments of the government; but they were all geniuses and had military training too. Theirs was not the "little knowledge."

Since the coming of such men cannot be predicted, it would seem unwise to base any system on it. Therefore, it would seem unwise to neglect the only other system by which an army and navy can be made really good, a system by which the lifelong members of those services control their purely military acts, by means of a general staff. This fact has just been recognized, so far as the army is concerned; and it implies no surrender by the civil authorities of perfect control *over* the army; it simply implies abstention from interference with details, details which are purely technical. It simply implies recognizing army officers as members of a real profession, in the same sense that doctors and clergymen and lawyers are recognized as members of real professions. The civil authorities lose no dignity by not interfering with matters that are purely technical, any more than an admiral does by not interfering with the internal administration of his flagship.

No boy can become an efficient man, if he be kept "tied to his mother's apron strings." No organization can become efficient, unless it be allowed to make and enforce rules for its own government, subject to the laws of the community. No navy can become efficient, unless it be allowed to work out, and to carry out, its own rules of strategy, tactics, and discipline; subject, of course, to the general control of the civil authority, to which it must render absolute obedience. No person, no organization, can become efficient, unless it be made responsible: and our own President has often declared that responsibility and authority go together.

The refusal of the civil authorities to give the navy the responsibility and authority which it needs, to be efficient, and the fact that the navy needs them even more than the army does, are both due to the same cause: the non-acquaintance of civilians with naval conditions, especially now when naval conditions are changing with such dizzying rapidity. But, the very difficulty of apply-

ing principles to modern naval conditions necessitates professional study of the subject; because that nation which succeeds in learning will acquire a decisive advantage. So clearly is this true, that one can declare with certainty that, if two navies fight, of equal strength, one directed by a general staff, and the other not, the one that is directed by a general staff will whip the other.

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THE ADMINISTRATION OF THE MASSACHUSETTS AND VIRGINIA NAVIES OF THE AMERICAN REVOLUTION.

By CHARLES OSCAR PAULLIN.

With the exception of New Jersey and Delaware each of the thirteen original states during the Revolution owned one or more armed vessels. Massachusetts, Connecticut, Pennsylvania, Maryland, Virginia, and South Carolina had the largest fleets. New Hampshire with its one ship and Georgia with its four galleys just escaped being in the same class with New Jersey and Delaware. The navies of Rhode Island, New York, and North Carolina were small. The navy of no one state was so large as that of Congress. The total number of state craft, however, greatly exceeded the number of vessels in the Continental navy. The state vessels on the average were smaller and not so well armed as the Continental vessels. The states generally had less means for naval purposes at their disposal than had Congress, and were therefore not so well able to build large vessels. Then, too, the chief need of each state for a navy was to defend its seaports, coasts, and trade. For such services small craft adapted for running in and out of shallow harbors, rivers, and bays, were demanded. The states, therefore, provided themselves with armed boats of various sizes, galleys with and without sails, half-galleys, floating batteries, barges, and fire-ships. Besides such vessels as these most of the states had a few larger and stouter sailing craft, mounting generally from ten to twenty guns and fairly well fitted for deep-sea navigation. The one state whose deep-sea exceeded its inshore craft was Massachusetts.

The history of naval administration in the several states possesses some common features. It will be recalled that in most of the states the provincial government about the year 1775 was superseded by a revolutionary government, and this in turn about a year later was succeeded by a permanent state government. The revolutionary government consisted of a legislative body, or Provincial Congress, and of an executive body, or Committee of Safety. The permanent state government consisted of a Legislature of one or two Houses and an Executive, which was either a Council, or a Governor and Council. The initial naval administration in the states usually fell to the Committee of Safety, or Revolutionary Executive, which upon the change to a permanent state government bequeathed its naval duties to the Council or to the Governor and Council. In most of the states the details of naval administration were at some time during the Revolution lodged with an Executive Board. In some states there were separate boards for naval and military affairs; in others, one board performed both functions.

The history of naval administration in the states falls into two periods, one embracing the years from 1775 to 1778, the other the years from 1779 to 1783. In the first period each state procured a naval armament, as a rule for the general purpose of providing a naval defence, and not to meet some specific call for armed vessels. By 1779 the first naval craft had been largely captured, destroyed, or sold; and often the first machinery of naval administration had been in large part removed. In response to special needs for armed vessels, calls for which came most often from those who were suffering from the ravages of the British fleets, the states now procured additional vessels, and often devised new administrative machinery to manage them.

In defensive warfare the problem in each state was to provide for the defence of its ports, trade, coasts, and shipping. The offensive warfare of the state navies, which was quite secondary in importance, consisted chiefly of commerce-destroying, conducted along the great ocean-paths of British trade. The principal problem here was for the American vessels in leaving home ports and in returning with their prizes to elude the British vessels, which hovered along the American coast, especially at the mouths of the Chesapeake, Delaware, and Narragansett bays. It is always to be remembered that in all the states the privateers

exceeded the state craft, which were often insignificant in comparison.

The reader will recall that in June, 1775, the battle of Bunker Hill was fought, a British army occupied Boston, and British vessels sailed the New England seas with little or no opposition. These vessels had already committed depredations and "piracies" upon the coasts and trade of Massachusetts, and were obstructing the importation of ammunition and provisions for the Continental army. It was under these circumstances that Massachusetts took her first step towards procuring a naval armament. On June 7, her Third Provincial Congress appointed a committee of nine "to consider the expediency of establishing a number of small armed vessels, to cruise on our seacoasts, for the protection of our trade, and the annoyance of our enemies." The Provincial Congress, which moved very cautiously, enjoined secrecy on the committee. On June 10, three additional members were added to the committee; but later in the day a new committee consisting of seven members was apparently substituted for the old one. On June 12, the committee "appointed to consider the expediency of establishing a number of armed vessels" made a report which provided for the fitting out of not less than six vessels, to mount eight to fourteen carriage guns, and to cruise under the orders of the Committee of Safety—the chief executive organ of the Provincial Congress, consisting of nine members, three of whom were from Boston. This report came up several times between June 12 and June 20. Finally on the latter date "the matter was ordered to subside."[1] The Battle of Bunker Hill, which was fought on June 17, may have had something to do with this action of the Provincial Congress.

On July 19, 1775, the Revolutionary Government in Massachusetts was superseded by a permanent government consisting of a House of Representatives and a Council of eighteen members elected by the House; the two houses were called the General Court. The continued depredations of the British now caused several endangered ports to ask the General Court to provide

[1] Journals of Third Provincial Congress of Massachusetts, June 7, June 10, June 11, June 12, June 13, June 16, June 19, and June 20, 1775. All references to the state records of Massachusetts refer to the manuscripts or early printed copies to be found in the State Library or State Archives at Boston.

them with a naval defence. The part of Massachusetts which during the Revolution was most exposed to the attacks of the British, and which was most troublesome to defend, was the coast of Maine, then often referred to as the Eastern Coast. In August, 1775, a petition came to the General Court from Machias, a town situated on the Maine coast a few miles west of the present Eastport, asking that commissions be granted to officers and men on board two armed vessels which citizens of Machias had fitted out for the defence of their town. In response the General Court took into the service of the state the sloop *Machias Liberty* and the schooner *Diligent*.[2] Jeremiah O'Brian, one of the men who had signed the petition, was commissioned by the Council commander-in-chief of the two vessels, and he was directed to enlist a number of men, not to exceed thirty, for each vessel. The *Machias Liberty* and the *Diligent* were in the service of the state until October, 1776, when they were discharged. About the first of October, 1775, Salem and Newburyport each asked the General Court for naval aid similar to that granted to Machias, but did not receive it.[3]

The General Court of Massachusetts next turned its attention to privateering. The acts of the states on this head fall into two general classes; those which in terms established state privateering, and those which adopted Continental privateering or accommodated state laws to the same. After the first half of 1776 all the states used Continental commissions and bonds. Massachusetts, moving in this matter before Congress, necessarily established state privateering. On September 28, 1775, her House of Representatives, having such establishment in view, appointed a committee of seven to consider the "Expediency of fitting out a Number of Armed Vessels." On October 9, this committee reported in favor of instituting privateering and a prize court to try cases of capture. On October 14 a bill embodying the committee's recommendations was introduced. It now passed slowly through the legislative mill, and on November 1, it became a law.[4]

[2] Journals of Massachusetts House of Representatives, August 21, 1775. O'Brian's name is found spelled in various ways.

[3] Journals of Massachusetts House of Representatives, September 29, October 2, October 4, 1775; Records of General Court of Massachusetts, October 4, 1775.

[4] Journals of Massachusetts House of Representatives, September 28, October 6, 9, 14, 17, 18, 19, 27, November 1, 1775.

John Adams once referred to this statute of Massachusetts as one of the most important documents in the history of the Revolution. Its preamble was the work of Elbridge Gerry, and the body of the law was drafted by James Sullivan, many years later Governor of Massachusetts.[3] Gerry stated the sanctions for the law. These he found in the arbitrary and sanguinary acts of Great Britain, in the charter of Massachusetts granted by King William and Queen Mary, and lastly in the resolution of the Continental Congress of July 18, 1775, recommending each colony to provide by armed vessels or otherwise for the protection of its harbors and navigation.

The Massachusetts law provided that all vessels convicted of making unlawful invasions or attacks on the seacoasts or navigation of any part of America should be forfeited. The Council was authorized to grant letters of marque and reprisal to masters and owners of vessels upon their entering into bond to faithfully discharge the duties of their office and to observe the naval laws of the colony. Three admiralty districts embracing the counties on the Massachusetts seacoast were established. The Southern district, with the seat of its court at Plymouth, embraced Plymouth county and the counties to the southward; the Middle district, with the seat of its court at Ipswich, embraced the counties of Suffolk, Middlesex and Essex and extended from Plymouth county to New Hampshire; and the Eastern district, with the seat of its court at North Yarmouth, embraced the seacoast counties of Maine. The form of procedure in these courts was fixed for both captured and recaptured vessels. In the latter case salvage was to be from one-third to one-fourth of the selling price of the vessel. The facts in prize cases were to be tried by twelve good and lawful men. At this time the people of Massachusetts were so enraged at the judges of the former Provincial admiralty court that they would have universally condemned the trying of facts in prize cases by judges.[4]

The Council soon appointed three judges of admiralty, Nathan Cushing for the Southern district, Timothy Pickering for the Middle district, and James Sullivan for the Eastern district. Elbridge Gerry declined the judgeship for the Middle district.

[3] Austin's Gerry, I, 94-95; Works of John Adams, X, 37.

[4] Amory's Sullivan, II, 378-79, James Sullivan to Gerry, December 25, 1779.

After trying about one hundred and fifty prize cases Pickering, in June, 1777, resigned and was succeeded by Nathan Cushing, who now served as judge in both the Southern and Middle districts.[7] Comparatively few cases were tried in the Southern and Eastern districts. Timothy Langdon was for a long time judge of the Eastern district.

During the fall of 1775 the General Court took no steps towards establishing a state navy. It was at this time assisting Washington in obtaining and arming vessels for the Continental military service around Boston. Early in December the House of Representatives, acting on a recommendation contained in a letter from John Adams at Philadelphia, resolved to obtain statistics on the number of officers, seamen, and vessels, suitable for naval purposes, in the seaports of Massachusetts. On December 29 the Council declared for a navy by passing the following resolution: "Whereas several of the United Colonies have of late thought it expedient and necessary to fit out armed Vessels for the Defence of American Liberty, and it appears to this Court necessary that Measures be taken by this Colony for our further Protection by Sea: Therefore, Resolved, that John Adams and Joseph Palmer, Esqurs. with such as the Hon. House shall join be a committee for fitting out one or more Vessels for the Defence of American Liberty."[8]

The House at once appointed its members of the committee, which on January 12, 1776, made a report favorable to the establishment of a navy.[9] Accordingly, on February 7, a resolution passed the General Court to build ten sloops of war, of 110 or 115 tons burden, each, suitable for carrying fourteen to sixteen carriage guns, 6-pounders and 4-pounders. A joint committee of the two houses was appointed to build the vessels, and £10,000 was voted for this purpose.[10] On the 16th the committee was

[7] Records of Massachusetts Council, November 14, December 9, December 12, 1775; Pickering's Pickering, I, 79-80; Amory's Sullivan, I, 63.

[8] Records of General Court of Massachusetts, December 29, 1775.

[9] Journals of Massachusetts House of Representatives, January 12, 1776. On January 11 the Council resolved that two ships, one of 36, and the other of 32 guns, should be built. On the same day both House and Council voted to recommit the resolution in order that the committee which prepared it might report on the expense to be incurred in building and fitting the two ships. It does not appear that further action was taken.—Records of Massachusetts Council, January 11, 1776.

[10] Ibid., February 6, 1776; Journals of Council, February 7, 1776.

authorized to contract for the building of only five vessels, until there was a prospect of procuring materials for ten; it was authorized to buy five vessels if it thought it best.[11] By July, 1776, the sloop *Tyrannicide* built at Salisbury, the brigantine *Rising Empire* built at Dartmouth, and the brigantine *Independence* built at Kingston were ready for sea; and by September the sloops *Republic* and *Freedom* built at Swanzey, and the *Massachusetts* built at Salisbury were completed.

Meanwhile the General Court had prepared and adopted the legislation necessary to establish a navy. It had drafted proper naval forms; and it had appointed a number of naval officers. A partial pay-table was established on February 8.[12] This on April 12 was succeeded by a new one, which generally raised wages, and which provided for a number of new offices. A captain was now to receive a monthly wage of £8; a first lieutenant, £5 8s.; a second lieutenant, £5; a master, £4; a mate, £3; a surgeon, £7; and an ordinary seaman, £2. Each vessel was to be provided with 115 officers and seamen. No better proof of the rawness of the naval service is needed than the regulation that recruits, whether officers, seamen, or marines should furnish themselves with "a good effective Fire Arm, Cartouch-Box, Cutlass, and Blanket." The captains were ordered to recommend to the Council a list of inferior officers and to enlist the proposed number of seamen and marines. Captors were given one-third of the proceeds of prizes.[13]

On April 27, 1776, the General Court fixed the respective shares of the proceeds of prizes for officers and seamen: a captain was to receive six shares, and "all the Cabbin Furniture;" a first lieutenant, five shares; a drummer, one and one-fourth shares; a seaman, one share; and a boy, one-half a share.[14] On April 29, in order to encourage enlistment, an advance of one month's wages was voted to recruits. On the same day it was decided that "the Uniform of Officers be Green and White, and that the Colours be a white Flagg, with a green Pine Tree, and an Inscription, 'Appeal to Heaven.'"[15] On July 26 the Council appointed a

[11] Journals of Massachusetts House of Representatives, February 16, 1776.
[12] Ibid., February 7, 1776; Records of Massachusetts Council, February 8, 1776.
[13] Journals of Massachusetts House of Representatives, April 12, 1776.
[14] Ibid., April 27, 1776.
[15] Ibid., April 29, 1776; Records of Massachusetts Council, April 29, 1776.

prize agent in each of the three admiralty districts, whose duty it was to represent the state in receiving, trying, and selling prizes.[16] At times the prize agents assisted in fitting out vessels.

During the first half of 1776 the law of November 1, 1775, establishing privateering was three times amended and re-modelled.[17] The law was thereby accommodated to the resolutions of the Continental Congress fixing the kinds of property subject to capture, and the respective shares of captors and recaptors. Doubts which had arisen as to the proper construction of the original act were now removed. The procedure before admiralty courts was made more specific. In cases of captures made by Continental vessels, appeals were permitted from state admiralty courts to the Continental Congress; in all other cases appeals were allowed to the superior state courts. In each of the three admiralty districts in Massachusetts additional towns were named where court might be held. The towns named for the Middle district were Boston, Salem, Ipswich, and Newburyport.

During the summer and fall of 1776 the instructions and orders to the captains of the armed vessels were issued to them by the Council, having been previously prepared by a committee. The following instructions which were drafted by Thomas Cushing and Daniel Hopkins were given to Captain John Fisk, and will suffice as a sample of such documents:

"The Brigantine *Tyrannicide* under your Command being properly Armed and Man'd and in other respects fitted for a Cruize you are hereby Ordered and directed immediately to proceed to Sea and Use your utmost Endeavours to protect the Sea Coast and Trade of the United States and you are also directed to exert yourself in making Captures of all Ships and other Vessels Goods Wares and Merchandise belonging to the King of Great Britain or any of his subjects wherever residing excepting only the Ships and Goods of the Inhabitants of Bermuda and the Bahama Islands—You are directed not to Cruize further Southward than Latitude Twelve North nor farther East than Longitude Nine Degrees West from London nor farther West than the Shoals of Nantucket. At all times using necessary precautions to prevent your Vessel from falling into the hands of the Enemy."

[16] Records of Massachusetts Council, July 26, 1776.

[17] Laws of Massachusetts, February 14, April 13, May 8, 1776.

"And Whereas you have received a Commission authorizing you to make Captures aforesaid and a set of Instructions have been delivered you for regulating your Conduct in that matter; these Instructions you are Hereby directed diligently to attend to, and if you are so fortunate as to make any Captures you are to Order them to make the first safe Harbor within the United States.—and you are furthered Ordered not to expend your Ammunition unnecessarily and only in time of Action or firing Alarm or Signal guns." [18]

Until October, 1776, the Massachusetts navy was administered by the General Court, committees of its members, the Council, and naval agents. The General Court for the period of its recess in May, 1776, placed the armed vessels in the charge of "the committee for fortifying the harbor of Boston." By the fall of 1776 it realized that "secrecy, dispatch, and economy in conducting the war" demanded a special executive department. Accordingly, on October 26 it established a Board of War consisting of nine members, any five of whom constituted a quorum. The Board of War was "empowered to Order and Direct the Operations of the Forces in the Pay of this State, both by sea and land, by giving the Commanders of the Troops, Garrisons, and Vessels of War, such Orders for their Conduct and Cruizes from time to time as they shall think proper." [19] It organized by electing a president and secretary; and it rented permanent quarters near the State House in Boston. In December, 1776, James Warren, later Commissioner for the Continental Navy Board at Boston, was president of the Board of War. Philip Henry Savage was for a long time its president. Savage presided at the meeting in 1773 at Old South Church which decided that the tea should not be landed.[20] The Board of War entered upon its work with vigor in November, 1776. It was yearly renewed, until it was dissolved in February, 1781.

The principal business of the Board of War was the administration of the naval, commercial, and military affairs of the state. Its naval and commercial duties were quite engrossing. The

[18] Records of Massachusetts Council, October 29, 1776. The naval documents introduced into the narrative on the Massachusetts navy are typical of similar ones in other states.

[19] Resolves of Massachusetts, October 26, 1776.

[20] Winsor's Memorial History of Boston, II. 543.

Board kept fairly distinct the activities of its "armed" and "trading" vessels. It is true that the armed vessels were now and then sent on commercial errands, or combined in a single voyage naval and trading duties. The sloop *Republic* used for a short time as a naval vessel was taken into the commercial service. The Massachusetts Archives contain a list of thirty-two trading vessels owned or chartered by the Board of War.[21] These vessels visited Nantes, Bilbao, Martinique, Guadaloupe, St. Eustatius, Cape Francois, Baltimore, and the ports of North and South Carolina. They carried as staple exports, fish, lumber, and New England rum. As a rule the work of the Board of War in looking after its trading vessels exceeded its naval work. At times, as in the case of the Penobscot expedition, the naval duties were the important ones. A week's work of the Board in behalf of its armed vessels shows a curious mixture of orders on the commissary-general for clothing and provisions, and on the state store keeper for naval stores; and of directions to the prize agents, the agents for building armed vessels, and the naval captains. The General Court permitted the Board a fairly free hand in its management of the navy. The Board carried on a considerable correspondence with the commanders of the armed vessels. The following letter written to the Board by Captain John Clouston of the armed sloop *Freedom* on May 23, 1777, from Paimboeuf, France, will illustrate this correspondence from the Captain's side. Clouston's disregard of orthography and punctuation is exceptional even for a Revolutionary officer.

[21] Massachusetts Revolutionary Archives, XL, 110-111. The influence of the friendly relations existing between the United States and France during the Revolution in the naming of vessels early manifested itself. On December 27, 1776, the Massachusetts Board of War changed the names of a number of its trading vessels as follows: Ships *Julius Caesar* to *Bourbon*, *Venus* to *Versailles*, and *Friend* to *Paris;* brigantines *Charming Sally* to *Penet*, and *Isabella* to *Count D'Estaing*. The brigantine *Penet*, which was named for a French merchant at Nantes, a member of the firm of Pliarne, Penet & Co., agents for the United States, has been sometimes confused with the brigantine *Perch*, which was obtained by Massachusetts in the fall of 1777 for the sole purpose of conveying the news of Burgoyne's surrender to the American Commissioners at Paris. The letters and dispatches were intrusted with Jonathan Loring Austin, secretary to the Board of War, who after a passage of thirty days reached the Commissioners at Passy on December 4, 1777.—Board of War Minutes, December 27, 1776; Hale's Franklin in France, I, 155.

"Gentlemen:

I have the pleasure of Informing your Honours by Capt. Fisk of the Massachusetts That on the first Instant I arrived safe in this Port after taking twelve Sail of Englis Vessels Seven of which I despatched for Boston Burnt three gave one smal Brigg to our Prisners and one Retaken by the Futereange which Chast us fore Glasses and finding she Could not Cume up with us she gave Chase to our Prize and toock her in our sight—I have Cleaned & Refited my Vessel and Taken in forty Tons of War like Stores and have bin waiting for a wind to go this fore days—Capt. Fisk being short of Provisions I have supplied him with foreteen Barels of Pork and Eleven of Beef and have Suffisantse for my Vessel left."[32]

In January, 1777, a new sea establishment was effected. Wages were generally raised, no doubt chiefly to meet their decrease caused by the depreciation of the currency. A captain was now to receive a monthly wage of £14 8s.; a lieutenant or a master, £7 4s.; a seaman, £2 8s.; and a boy, £1 4s. The offices established in the Massachusetts navy, while not quite so many, were in general the same as those in the Continental navy. The Massachusetts navy however had the offices of prizemaster, pilot, and boy, which did not occur in the Continental list. Following the regulations of Congress the General Court now gave captors one-half of their captures. The rations for seamen were modelled on the Continental bill of fare.[33] On March 21, 1777, the General Court adopted rules and regulations for its ships of war; and it ordered that they should be read by the commanding officer of a vessel at least once a week. These rules, while briefer than the Continental rules, naturally followed the same general lines. They show either the influence of the Continental rules or of the English rules upon which the Continental rules were based. The following curious rule in part parallels one of the Continental rules.

"And if any Person belonging to either of such Vessels shall be convicted of Theft, Drunkenness, profane Cursing, or Swear-

[32] Board of War Letters, Massachusetts Revolutionary Archives, May 23, 1777.

[33] Massachusetts Resolves, January 8, January 24, 1777. On December 6, 1776, six naval offices were established, which included a captain's clerk, prizemaster, and sergeant of marines.

ing, disregarding the Sabbath, or using the Name of God lightly, or profanely, or shall be guilty of quarrelling or fighting, or of any reproachful or provoking Language tending to make Quarrels, or of any turbulent or mutinous Behavior, or if any Person shall sleep upon his Watch, or forsake his Station, or shall in any wise neglect to perform the Duty enjoined him, he shall be punished for any of the said Offences at the Discretion of the commissioned Officers of such Vessel, or the Major Part of them, according to the Nature and Aggravation of the Offence, by sitting in the Stocks, or wearing a wooden Collar about his Neck, not exceeding 4 Hours, nor less than one, or by whipping, not exceeding 12 Lashes, or by being put in Irons for so long Time as the said Officers shall judge the Safety and well being of the Ship and Crew requires, or otherwise shall forfeit to the State not more than six, nor less than two Days Pay for each offence."[24]

During every year of the Revolution attempts were made to increase the Massachusetts navy. In the fall of 1777 the brigantine *Hazard* was added. On August 6, 1777, the General Court resolved that, since the armed vessels at the lowest computation had netted the state £55,000, the Board of War should purchase or build two vessels mounting 28 and 32 guns respectively. In January, 1778, it reduced the sizes of these vessels almost one-half; and finally it gave up building them.[25] In the spring of 1779 a prize of the *Hazard*, the brigantine *Active*, taken in April off the island of St. Thomas in the West Indies, was purchased.[26] In April, 1778, the General Court resolved to build a

[24] Massachusetts Resolves, March 21, 1777.

[25] Ibid., August 6, 1777; January 17, 1778.

[26] The following is an extract from the enlisting contract of the armed brig *Active*, which was signed by officers, seamen, and marines: "And we hereby bind ourselves to Submit to all orders and regulations of the Navy of the United States of North America and this State and faithfully to observe and obey all such orders, and Commands as we shall receive from time to time from our Superior Officers on board or belonging to the said Brig, *Active*, and on board any Such Boats or Vessel or Vessels as foresaid.

"And it is on the part of the State that such persons as by Land or sea shall Loose a Limb in any Engagement with the Enemies of these United States of America or be otherwise so disabled as to be rendered incapable of getting a Lively Hood Shall be entitled to the same Provisions as the disabled Persons in the Continental Service."—Massachusetts Revolutionary Archives, XL, 20.

frigate of 28 guns which would carry two hundred officers and men.[22] This vessel was built at Newburyport and was named the *Protector*. In the fall of 1779 it was nearing completion. The launching of the *Protector*, which was the largest ship in the Massachusetts navy, was a matter of more than usual local interest. Stephen Cross who was in charge of the construction of the frigate wrote a letter to the Board of War in July, 1779, which throws light upon the minor naval duties of the Board. Cross's language is a bit involved, but his meaning is clear; it is hardly necessary to say that the "souring" refers to lemons.

"Gentlemen:

it being customary for the owners of Vessels when they are Launched to give the Workmen something Better than New England Rum to drink & Likewise something to Eat and also all those Persons who attend the Launching Expect to be asked to Drink and Eat something and Especially Publick Vessells it will be Expected that something be Provided and it is my opinion about sixty Galls of West India Rum & sugars for the same & souring if it be had and one Quarter Cask of Wine and A Hamper of ale or Beer together with a Tierce hams Neet Tongs or Corn Beef will be necessary to comply with the Customs in these Cases."[23]

After August, 1779, when the disaster on the Penobscot occurred the naval duties of the Board of War were slight. For a time the *Protector* was the only vessel in the navy. With the coming in of a new government under a Constitution on October 25, 1780, there was no longer much need for a Board of War. According to the provisions of the new Constitution the Governor was commander-in-chief of the navy; and he was authorized to "train, instruct, exercise, and govern it," and to call it into service in time of war. On February 8, 1781, the Board of War was discontinued, and Caleb Davis, who was appointed Agent of the Commonwealth, succeeded to its ministerial duties.[24] The Governor and the Agent now shared the naval duties. The Governor commissioned officers, issued orders to the naval commanders, and was responsible to the General Court; the Agent had

[22] Massachusetts Resolves, April 21, 1778.

[23] Massachusetts Revolutionary Archives, XLIV, 279.

[24] Massachusetts Resolves, February 8, 1781. Three members of the Board of War and two clerks were continued for a few months to settle the accounts of the Board.

direct oversight of the fitting out of vessels, the selling of prizes, and was responsible to the Governor. As the Revolution spent itself the simplification of the administrative machinery of the state continued. On January 1, 1783, the Agent was discontinued. His naval duties fell to the Commissary-General.[20]

During each year from 1780 to 1783 the General Court made one or more attempts to increase the naval force of the state. It was spurred to action by the ravages of the British cruisers on the Eastern Coast. On March 21, 1780, two armed vessels mounting not less than ten or more than fourteen 4's or 6's were ordered. The expense incurred was to be met by the sale of the "Rising Empire" and of the confiscated estates of Loyalists, and from rents of the property of absentees. On March 6, 1781, the Agent was directed to obtain a small vessel of eight to twelve guns to serve as a tender for the *Mars;* and on April 23 he was ordered to procure by hire or purchase two small craft to be employed as "guarda coasta." On November 12, 1782, a committee was appointed to purchase a vessel of twelve or sixteen guns to be used in protecting the coast. On March 26, 1783, the Commissary-General was ordered to obtain a small vessel and a whaleboat to cruise against the enemy in Casco Bay and along the Eastern Shore.[21] As the result of these resolutions four armed vessels were added to the navy; in the spring of 1780 the *Mars;* in the summer of 1781, the *Defence;* in the winter of 1781-1782, the *Tartar,* which was built by the state; and in the spring of 1782, the *Winthrop.*

Private naval enterprise throughout the Revolution was exceedingly active in Massachusetts. In 1775, some months before the General Court granted letters of marque, Massachusetts citizens unauthorized were capturing the vessels of the enemy. Scarcely a fortnight after the battles of Lexington and Concord men from New Bedford and Dartmouth fitted out a vessel and attacked and cut out from a harbor in Martha's Vineyard a prize of the British sloop-of-war *Falcon,* 16. This act was called forth by the captures which the *Falcon* had made from the people of Buzzard's Bay. On June 12, 1775, the inhabitants of Machias, Maine, had captured the King's sloop *Margaretta,* Lieutenant Moore, after mortally wounding the commander and inflicting a

[20] Ibid., October 4, 1782.

[21] Massachusetts Resolves, March 21, 1780; February 19, March 6, April 23, 1781; November 12, 1782; March 26, 1783.

loss of fourteen men. Still other British vessels were captured off the coast of Maine during the summer of 1775.[82]

With the act of November 1, 1775, granting the Council the power to issue letters of marque and reprisal, all such private enterprises as the above when done under the authority of a commission were legal. It does not appear however that Massachusetts granted many commissions until the second half of 1776. In 1777 she granted 96 commissions. The best year was 1779 when she issued 222 commissions; the year 1781 with 216 commissions was not far behind. The total number of commissions issued by Massachusetts for the years 1777 to 1783 was 998.[83] In 1779 one hundred and eighty-four prizes captured by privateers were libelled in the Massachusetts prize courts.[84] The privateering industry in this year was very active. The following is an extract from a letter dated May 16, 1779, written from a Massachusetts seaport:

"Privateering was never more in vogue than at present; two or three privateers sail every week from this port, and men seem as plenty as grasshoppers in the field; no vessel being detained an hour for want of them. We have near 1,000 prisoners on board the guard-ships in Boston, and a great balance due us from the enemy. Cruisers from New York, &c are daily brought in, and often by vessels of inferior force; our privateers-men being as confident of victory, when upon an equal footing with the English, as these were of gaining it of the French in the last war."[85]

The rivalry between the state service and privateers for seamen was exceedingly active. In 1779 the Council recommended that some effectual measures be taken to prevent the owners of private ships of war and merchantmen from seducing seamen away that were engaged in the public service. It declared that proper encouragement must be given to state officers and seamen, and that commanders must have the aid of the government in manning their vessels, "or they will lie by the Walls and so be of little or

[82] Winsor, Narrative and Critical History, VI, 564; Maclay, History of American Privateering, 52-60.

[83] Massachusetts Revolutionary Archives. The total number of privateering commissions always exceeds the total number of vessels, as the same vessels were often commissioned two or more times.

[84] Boston Gazette for 1779.

[85] Virginia Gazette, June 19, 1779.

no service."[86] In 1778 the General Court found some difficulty in securing commanders.

The movements of the armed vessels of the Massachusetts navy were quite similar to the movements of the naval vessels of Congress.[87] The smaller fleet like the larger cruised in European waters, in the region of the West Indies, and to the eastward of the Bermudas in the path of the richly-laden West Indiamen. The Massachusetts vessels, however, cruised more frequently nearer home. About the first of June, 1779, the *Hazard* and *Tyrannicide* were in the region of Nantucket. After 1779 the vessels were frequently ordered to protect the Eastern Coast. In the spring of 1777 the *Tyrannicide,* Captain Jonathan Haraden, *Massachusetts,* Captain John Fisk, and *Freedom,* Captain John Clouston, cruised eastward as far as the coasts of France and Spain, capturing some twenty-five prizes, many of which however were recaptured by the British.[88] This was a most fortunate ven-

[86] Journals of House of Representatives, January 6, 1779.

[87] The vessels in the Massachusets navy with the approximate periods of their service was as follows: Sloop, *Machias Liberty,* 1775-1776; schooner, *Diligent,* 1775-1776; brigantine (at first a sloop), *Tyrannicide,* 1776-1779; brigantine, *Rising Empire,* 1776-1777; brigantine, *Independence,* 1776-1777; sloop, *Republic,* 1776-1777; sloop, *Freedom,* 1776-1777; brigantine, *Massachusetts,* 1776-1778; brigantine, *Hazard,* 1777-1779; brigantine, *Active,* 1779; frigate, *Protector,* 1779-1781; ship, *Mars,* 1780-1781; sloop, *Defence,* 1781; ship, *Tartar,* 1782-1783; sloop, *Winthrop,* 1782-1783; and galley, *Lincoln,* 1779-1781. Most of these vessels mounted from ten to twenty guns, 4's and 6's. The only larger vessel was the *Protector,* 26. Vessels such as the *Tyrannicide, Hazard,* and *Winthrop* carried about 125 officers and men. The following captains were the chief officers in the Massachusetts navy: Jeremiah O'Brian, John Lambert, John Fisk, John Foster Williams, John Clouston, Jonathan Haraden, Daniel Souther, Simeon Samson, Richard Welden, Allen Hallet, James Nevens, John Cathcart, and George Little. Massachusetts did not establish the rank of commodore.

[88] These three vessels captured the four prizes mentioned in the following advertisement which appeared in the Continental Journal and Weekly Advertiser for July 3, 1777, a paper published at Boston. The advertisement is introduced here to illustrate the final disposition of prize vessels:

To be sold by Public Auction at eleven o'clock on Wednesday the 23d of July instant at Mr. Tileston's wharf in Boston, the following prizes with their appurtenances.

The Ship *Lonsdale,* about 250 tons. Brig *Penelope,* about 130 tons.
Brig *Britannia,* about 140 tons. Scow *Sally,* about 180 tons.

The above prizes lay at Tileston's wharf. They are all good vessels and well found. Inventories to be seen at the sheriff's office Cornhill, and at the place of sale. W. GREENLEAF, Sheriff.

ture, for all told one can not now count more than seventy prizes captured by the Massachusetts navy. In the summer of 1780 the Board of War turned over the *Mars,* Captain Simeon Samson, to the Massachusetts Committee for Foreign Affairs which sent her to France and Holland for supplies.

The state vessels were at times joined in cruises with privateers or with Continental vessels; and enterprises were concerted with all three classes of armed craft. In April, 1777, the state took into its service for a month nine privateers, mounting 130 guns, and carrying 1,030 men, to cruise with the Continental frigates *Hancock* and *Boston* after the British frigate *Milford* which had been especially annoying and destructive to the trade of the state.[39] In February, 1781, the *Protector* was cruising with the Continental frigate *Deane* thirty leagues windward of Antigua. In March, 1781, the Admiral of the French fleet at Newport was requested to send two French ships to cruise with the *Mars* on the Eastern Shore; and a bounty was offered to privateers who would cruise against the "worthless banditti" in that region.[40]

The capture of a prize often amounted to little more than the chasing of a merchantman and the firing of a few shots as a signal for surrender. At times, however, when the merchantman was armed or when the enemy's vessel happened to be a privateer the action was more serious. One of the most severe single engagements in which a Massachusetts vessel was concerned was that between the *Protector* 26, Captain John Foster Williams, and the privateer frigate *Admiral Duff* 32, Captain Stranger. It took place on June 9, 1780, in latitude 42° N. and longitude 47° W. The engagement was heavy for an hour and a half when the *Admiral Duff,* having caught fire, blew up, all on board being lost except fifty-five men who were picked up by the *Protector.* The American vessel lost six men.[41] The following brief account of one of these minor engagements told in the simple and direct language of the Massachusetts captain who took part in it is taken from a letter of Captain Allen Hallet to the Board of War, which is dated at sea on board the *Tyrannicide,* latitude 28° N., longitude 68° W., March 31, 1779. This graphic account shows with

[39] Massachusetts Resolves, April 26, 1777; Massachusetts Revolutionary Archives, XL, 29, 55.

[40] Massachusets Resolves, March 2, 1781.

[41] Massachusetts Gazette, July 24, 1780.

clearness the character of the minor engagements of the Revolution.

"I have the pleasure of sending this to you by Mr. John Blanch who goes prizemaster of my Prize, the Privateer Brig *Revenge*, lately commanded by Capt. Robert Fendall belonging to Grenada, but last from Jamaica, mounting 14 Carriage Guns, 6 & 4 pounders, 4 swivels & 2 Cohorns, & sixty ablebodied Men, which I took after a very smart & Bloody Engagement, in which they had 8 men killed & fourteen wounded, the Vessell cut very much to pieces by my Shott, so that they had no command of her at all—amongst the killed was the 1st Lieut. & one Quarter Mr.—amongst the wounded is the Capt. 2nd. Lieut. & Gunner—I captured her as follows: on the 29 Inst. at 4 PM. I made her about 4 leagues to windward coming down upon us, upon which I cleared the Ship and got all hands to Quarter, ready for an Engagement, I stood close upon the Wind waiting for her, about half past six PM. she came up with me, and hailed me, ask'd me where I was from, I told them I was from Boston & asked where they were from, they said from Jamaica & that they were a British Cruizer, I immedately told them I was an American Cruizer, upon which they ordered me to Strike, & seeing I did not intend to gratify their desires, they rang'd up under my Lee & gave me a Broadside, I immediately return'd the Compliment & dropping a Stern, I got under their Lee and then pour'd our Broadsides into her from below and out of the Tops, so fast & so well directed that in one hour & a Quarter we dismantled two of her Guns & drove them from their Quarter & compell'd them to Strike their Colors, during the whole Engagement we were not at any one time more than half Pistol Shott distant & some part of the Time our Yards were lock'd with theirs—I had Eight men wounded only two of which are Bad—amongst the wounded are my first Lieut. & Master, I intended to man her and keep her as a Consort during the Cruize, but having twenty wounded Men on board, of my own men & prisoners I thought it Best to send her home, with all the wounded men on board under the Care of the Surgeons Mate."[42]

By far the largest naval undertaking of the Revolution made by the Americans was the Penobscot Expedition. Until 1779

[42] Massachusetts Revolutionary Archives, XLIV, 408.

the general policy of those who managed the fleet of Massachusetts was to send its vessels cruising against the British transports, merchantmen, and small privateers, leaving the coast to be defended by the seacoast establishment and by local forces. In August, 1777, the Council agreed with this policy for it then spoke of the Continental vessels, the state vessels, and the privateers as "imporper" to be employed in clearing the coasts of these "vermin."[45] In April, 1779, it disapproved this policy. It now in a message to the House submitted whether, instead of sending the armed vessels of the state on long cruises after prizes, it would not have been vastly more to the advantage and profit of the state to have employed them cruising on the coast of Massachusetts for the protection of trade and the defence of harbors and seacoasts, "which have been left in such an unguarded and defenceless Situation that where we have taken one Vessel of the Enemy their small privateers out of New York have taken ten from us."[46] It would seem that the Board of War was right in employing its fleet in prize-getting rather than in defensive warfare. The capturing of small privateers and merchantmen were the only enterprises for which the Revolutionary fleets were adapted. Those vessels that cruised continually near the American coast sooner or later fell foul of the stouter and better armed ships of the enemy. The Board of War, had it not responded to the commercial spirit of the times, would have been compelled to adopt the methods of the privateers, did it wish to succeed in its competition with them for seamen.

During the first half of 1779 the British vessels were very destructive to the trade and shipping of Massachusetts and New Hampshire. On June 9, 1779, eight hundred of the enemy, encouraged by certain Tories in Maine, effected a lodgement on the Maine coast at a place called Bagaduce, now Castine, near the mouth of the Penobscot river.[47] This made a fine vantage-point

[45] Ibid., 268.

[46] Journals of Massachusetts House of Representatives, April 7, 1779.

[47] Amory's Sullivan, II, 376-78, James Sullivan to John Sullivan, August 30, 1779. James Sullivan says that the occupation of Bagaduce by the British greatly alarmed Boston and neighboring seaports at the prospect of a scarcity of wood; and that men who had made their fortunes by war, for once and for a moment, felt a public spirit, and freely offered their ships to the government. They were careful to have their ships appraised and insured by the state, which of course suffered the loss on the failure of the expedition.

as a base for naval operations. The appeal for naval protection which the inhabitants of Massachusetts now made upon her was a strong one. Towards the close of June the Massachusetts government began concerting with the Continental Navy Board at Boston and with the government of New Hampshire an expedition to capture and destroy this British station. Samuel Adams, who had recently retired from the chairmanship of the Marine Committee of Congress and had returned to Boston furthered the enterprise. To the fleet which was now formed, New Hampshire contributed the *Hampden*, 22; the Navy Board at Boston, the Continental vessels, *Warren*, 32, *Providence*, 12, and *Diligent*, 12; and Massachusetts, the three state brigantines, *Tyrannicide*, 16, *Hasard*, 14, and *Active*, 14, together with thirteen privateers, which were temporarily taken into the state service. These twenty armed vessels mounted in all 324 guns, and were manned by more than 2,000 men. Besides the armed fleet there were twenty transports which carried upwards of 1,000 state militia. The naval forces were under the command of Captain Dudley Saltonstall of the Continental navy; and the troops were commanded by Brigadier-General Solomon Lovell of the state military forces of Massachusetts. Paul Revere was Chief of Artillery with the rank of Lieutenant Colonel.

The assembling, manning, provisioning, and fitting of so many vessels greatly taxed the resources of Massachusetts. The fleet left Boston on July 19, and during the last days of the month it appeared off the Penobscot and attacked Bagaduce with only partial success, failing to take the main fort. Before a second attempt was made a British fleet from New York under the command of Sir George Collier, who had received news of the expedition, appeared in the Penobscot. The British fleet consisted of the *Raisonnable*, 64; *Blonde* and *Virginia*, 32's; *Greyhound*, *Camilla*, and *Gallatea*, 20's; and *Otter*, 14; together with three small vessels at the garrison, the *Nautilus*, 16, *Albany*, 14, and *North*, 14. It mounted 248 guns and carried more than 1600 men. In number of guns and men the advantage lay with the Americans, but in weight of metal and tonnage it was probably with the British. On the morning of August 14 the British fleet came in sight of the American. The two fleets were barely in range of each others guns when the Americans were seized with a panic, and fled with their vessels helter skelter up

the river, pursued by the British. The Americans offered almost no resistance whatever, but ran their ships ashore, set fire to them, and escaped afoot, when not too closely pursued. With the exception of two or three vessels which were captured, the American fleet was annihilated. The British lost 13; the American loss has been placed at 474. The larger part of the American sailors and soldiers returned by woods to New Hampshire and Massachusetts.

The total cost of this expedition to Massachusetts as calculated by the Board of War was £1,739,175. The larger part of this sum £1,390,200 was charged to the account of the navy. It suffered the loss of three state armed vessels and a victualer, nine privateers, and twenty transports. Among the twenty transports, with possibly one exception, was the whole trading fleet of the state. Soon after the disaster a joint committee of the Massachusetts House of Representatives and Council with Artemas Ward as president, held an inquiry and made a report on the causes of the failure of the expedition. In answer to the question, "what appears the principal reason of the failure," the committee decided unanimously, "want of proper Spirit and Energy on the part of the Commodore." A court-martial which was held on the frigate *Deane* in Boston harbor about the first of October found against Captain Saltonstall, and dismissed him from the navy. Rarely has a more ignominious military operation been made by Americans than the Penobscot Expedition. A New Englander with some justice has likened it to Hull's surrender at Detroit. Had it been successful, it would not have been worth the effort it cost. Its object had no national significance; it was an eccentric operation. "Bad in conception, bad in preparation, bad in execution, it naturally ended in disaster and disgrace."[*]

Besides the *Tyrannicide*, *Hasard*, and *Active* the Massachusetts navy lost to the enemy at least three other vessels. Towards the close of 1777 the British captured the *Freedom* and *Inde-*

[*] Massachusetts Revolutionary Archives, CXLV, 199-203, 350; Weymouth Historical Journal, chapters VII-X, gives the best account of the Penobscot expedition, also contains the Original Journal of General Solomon Lovell kept on the expedition; Massachusetts Historical Society Collections 7th, II, 430; Proceedings of Massachusetts Historical Society 2d, XII, 201-202; Clowes' Royal Navy, IV, 28-29.

pendence. On May 5, 1781, His Majesty's ships *Roebuck*, 44, and *Medea*, 28, captured the *Protector*, 26, with more than one hundred and thirty men on board.[a] She was added to the Royal Navy as the *Hussar*. In the latter half of 1782 Captain George Little in the *Winthrop* cruised on the Eastern Coast and captured and sent into Boston "nearly the whole of the arm'd force they possessed at Penobscot," thus in part retrieving the naval honor of his state.[b] Acting under orders of Governor Hancock, Little in the *Winthrop* made the last cruise of the Massachusetts navy when in the winter of 1782-1783 he visited Martinique. On his return, he was fitting for a cruise on the Eastern Coast when about April 1, news of permanent peace arrived. On June 4, 1783, the Commissary-General was directed to sell the *Winthrop*, the last vessel in the navy. The *Tartar* had been sold during the past winter.[c] Captain Little's accounts were being settled in March, 1785.

In July, 1775, Virginia began to raise and officer an army of more than one thousand men. By the fall of that year Lord Dunmore, the Provincial Governor of Virginia, who in June had retreated to His Majesty's ship *Fowey* at Yorktown, had collected a small flotilla, and had begun a series of desultory attacks upon the river banks of Virginia. On October 25 he was repulsed at Hampton; on December 9 he was beaten by the Virginia patriots at Great Bridge; and on January 1 he burned Norfolk. His movements excited so much alarm that the leading patriot families on the James, York, Rappahannock, and Potomac rivers retreated inland for safety. In order to prevent the depredations of Lord Dunmore, and to provide effectually for the general defence of the state, the Virginia Provincial Convention in December authorized the Committee of Safety of the state to "provide from time to time such and so many armed vessels as they may judge necessary for the protection of the several rivers in this colony, in the best manner the circumstances of the country will admit." The Committee of Safety was further directed to raise a sufficient

[a] Massachusetts Revolutionary Archives, XXXIX, 45.

[b] Ibid., CLVIII, 274, Message of Governor Hancock to House of Representatives, February 6, 1783.

[c] Massachusetts Resolves, June 4, 1783. Those naval vessels which were not captured, destroyed, or sold, were either returned to their owners, when rented, or thrown out of commission and employed in other services.

number of officers, sailors, and marines; and settle their pay, provided certain specified rates were not exceeded. The maximum wage of "the chief commander of the whole as commodore" was fixed at fifteen shillings a day.[80]

Between December, 1775, and July, 1776, the Committee of Safety procured and established a small navy. On April 1 it fixed the naval pay, generally at the maximum rates permitted. Captains in the navy were to receive a daily wage of 8s.; captains of marines, 6s.; midshipmen, 3s.; marines, 1s. 6d. The Committee resolved that two years ought to be a maximum period of service. It appointed a number of the most prominent officers in the Virginia navy, among whom were Captains James Barron, Richard Barron, Richard Taylor, Thomas Lilly, and Edward Travis. It fixed the relative rank between army and navy officers. It purchased the boats *Liberty* and *Patriot*, the brigs *Liberty* and *Adventure*, and the schooner *Adventure*. It contracted for the construction of a number of galleys on the different rivers of the state.[81]

George Mason and John Dalton were appointed a committee to build two row-galleys, and buy three cutters for the defence of the Potomac. In April, 1776, Mason wrote that the galleys were well under way, and that three small vessels had been purchased, of which the largest was a fine stout craft of about 110 tons burden, mounting fourteen 8's and 4's, carrying ninety-six men, and named the *American Congress*. A company of marines for this vessel, he said, were being exercised in the use of the great guns.[82] The Committee of Safety chose a "Lieutenant of Marines in the Potomac river Department."

The Provincial Convention of Virginia, which met at Williamsburg on May 6, 1776, being convinced that the naval preparations would be conducted more expeditiously and successfully if proper persons were appointed to superintend and direct the same, chose a Board of Naval Commissioners consisting of five per-

[80] Hening, Statutes of Virginia, IX, 83.

[81] Calendar of Virginia State Papers, VIII, 75-240, Journal of Committee of Safety of Virginia, February 7 to July 5, 1776. Virginia had a class of vessels which she referred to as armed boats. They were smart craft, and appear to have been schooner-rigged.

[82] Miss Rowland's George Mason, I, 214, 218.

sons.[84] The Board was authorized to appoint a clerk and assistants, and to elect from its membership a First Commissioner of the Navy, the title of a well-known officer in the English naval service. No member of the Board could sit in the legislature or hold a military office. Each Commissioner was to receive twenty shillings a day, when employed. On the depreciation of the currency this was doubled.[85] A majority of the Board constituted a quorum. Thomas Whiting served as First Commissioner of the Board throughout its existence.

In general the business of the Navy Board was to "superintend and direct all matters and things to the navy relating." It had charge of the building, purchase, fitting, arming, provisioning, and repairing of all armed vessels and transports. It had charge of the shipyards and the public rope-walk. In case of vacancies in the navy or the marines it recommended officers to the Governor and Council. It could suspend an officer for neglect of duty or for misbehavior. It was to keep itself informed on the state of the navy through reports from the naval officers. It was authorized to draw warrants on the treasury for money expended in the naval department, and to audit the naval accounts.

The Navy Board had charge of naval affairs in Virginia for three years, from the summer of 1776 until the summer of 1779. During 1776 and 1777 vessels were built on the Eastern Shore of Virginia, on the Potomac, Rappahannock, Mattapony, Chickahominy, and James rivers, and at Portsmouth, Gosport, and South Quay. After 1777 vessels were chiefly built at the Chickahominy and Gosport shipyards. No other state owned so much land, property, and manufactories, devoted to naval purposes as Virginia. In April, 1777, the Navy Board purchased 115 acres of land, for £595, on the Chickahominy twelve miles from its confluence with the James.[86] Virginia's ships found here a safer retreat than at Gosport, which lay convenient for the enemy's

[84] Hening, Statutes of Virginia, IX, 149-51. The Provincial Convention which met May 6, 1776, adopted a Constitution which provided for a Legislature of two houses, and an Executive consisting of a Governor and a Privy Council of eight members.

[85] Ibid., 521-22, October session of General Assembly in 1778.

[86] Southern Literary Messenger, 1857, 14. The references to this magazine refer to a series of valuable articles entitled the "Virginia Navy of the Revolution."

ships. It is said that before the Revolution the British had established a marine-yard at Gosport, and named it for Gosport, England, where they had an important dockyard. In some way Virginia came into possession of the shipyard at this place.[10] Two ships were built for the defence of Ocracoke Inlet, the chief entrance to Albemarle Sound, at South Quay on the Blackwater a few miles north of the North Carolina line.

At Warwick on the James a few miles below Richmond the state built and operated a rope-walk. The state owned a manufactory of sail-duck and a foundry. In July, 1776, four naval magazines were established, one each for the James, York, Rappahannock, and Potomac rivers. For each magazine one or two agents were appointed to collect and issue provisions, ship-supplies, and naval stores.[11] For the location of the magazine on the Potomac the General Assembly authorized the Navy Board to purchase an acre of land at the head of "Potomack Creek."[12] In January, 1777, the Navy Board appointed James Maxwell, Naval Agent, to superintend the shipyards, and the building, rigging, equipping, and repairing of the naval vessels. He was to follow the instructions of the Board and keep it informed on the state of the navy.[13] Maxwell's annual salary was £300, payable quarterly. He lived at the Chickahominy shipyard.

Virginia had a naval staff consisting of pay masters, muster masters, surgeons, and chaplains. The captains and recruiting officers enlisted seamen. Their task was rendered difficult not so much on account of the superior attractions of privateering, as in New England, as because of the small number of seamen resident in the state. The first commodore of the Virginia navy was John Henry Boucher. He was serving as lieutenant in the Maryland navy when in March, 1776, Virginia called him to the command of her Potomac fleet, and soon promoted him to the head of her navy.[14] He served as commodore for only a few months, resigning in November, 1776. Walter Brooke was commodore from April, 1777, until September, 1778. Brooke's

[10] E. P. Lull, History of U. S. Navy Yard at Gosport, Virginia, 8-11.
[11] Journals of Virginia Navy Board, Virginia State Archives, June 25, June 26, 1776.
[12] Hening, Statutes of Virginia, IX, 235-36.
[13] Journals of Virginia Navy Board, January 7, 1777.
[14] Maryland Archives, XI, 293-94.

successor, James Barron, was not appointed until July, 1780; he served until the end of the war. The commodore of the navy made his headquarters regularly at or about Hampton, and superintended the armed vessels in that part of the state.[a]

In Virginia, as in other states and in the Continental Congress, naval enthusiasm and interest was at its height in 1776. In the fall of that year the Navy Board contracted for the building of twenty-four small transports.[b] The General Assembly in its October session authorized the Navy Board to construct two frigates of thirty-two guns each, and four large galleys adapted "for river or sea service." For manning these galleys and those already building the Navy Board was empowered to raise thirteen hundred men, exclusive of officers, to serve three years from March 3, 1777. It was to recommend proper officers to the Governor and Council. Having been commissioned by the Governor, the officers were to enlist the crews of their respective galleys. As it would be impossible to secure a sufficient number of experienced seamen, it was provided that each crew should consist of three classes of men: able seamen, at a daily wage of 3s.; ordinary seamen, at 2s.; and common landsmen, at 1s. 6d. As the men in the second and third classes became proficient, they were to be promoted. Every recruit was given a bounty of $20.[c]

The Provincial Convention in its December session in 1775 erected a Court of Admiralty consisting of three judges to enforce the Continental Association against trading with England. In its May session in 1776 it gave this court jurisdiction over all captures of the enemy's vessels. The General Assembly at its October session in 1776 superseded all previous admiralty legislation by an "Act for Establishing a Court of Admiralty." Such court was to consist of three judges elected by joint ballot of the two houses of the General Assembly. They were to hold their offices "for so long a time as they shall demean themselves well therein." The court, which was to be held at some place to be fixed by the General Assembly, was to have cognizance of "all

[a] Journals of Virginia Navy; State Navy Papers, I; Southern Literary Messenger, 1857, 3.

[b] Journal of Virginia Navy Board, September-October, 1776.

[c] Hening, Statutes of Virginia, IX, 196-97. In August, 1776, the Navy Board drew up a list of naval rules which were endorsed by the Governor and Council. Journals of Virginia Navy Board, August 2, 1776.

causes heretofore of admiralty jurisdiction in this country." Its proceedings and decisions were to be governed by the regulations of the Continental Congress, the acts of the General Assembly of Virginia, the English Statutes prior to the fourth year of the reign of James; and by the laws of Oleron and the Rhodian and Imperial laws, so far as they have been heretofore observed in the English courts of admiralty. In cases relating to captures from a public enemy with whom the United States should be at war, and in which a conflict should arise between the regulations of Congress and the acts of the General Assembly, the regulations of Congress should take precedence; in all other cases of conflict the acts of Virginia were to prevail. This provision is of particular interest. It is one of the first instances in which a state recognized the superiority of federal law when in conflict with state law. Virginia was liberal in granting appeals to Congress, as she permitted them in all cases of capture of the enemy's vessels.[a]

The Admiralty Court of Virginia had few prize cases. Governor Thomas Jefferson in writing to the President of Congress in June, 1779, no doubt understates the truth when he says that "a British prize would be a more rare phenomenon here than a comet, because one has been seen, but the other never was." His state, he said, had long suffered from a lack of blank letters of marque, and he wished fifty to be sent to him.[b] Virginia did not establish state privateering, but followed the regulations of Congress on this subject. Because of the lack of seamen and the continual presence of the enemy's vessels at the mouths of the Virginia rivers, the privateering interest was not important in this state.

The Navy Board superintended both the trading and armed vessels of the state until April, 1777, when the trading vessels were placed in charge of William Aylett.[c] Writers on the Virginia navy have not as a rule distinguished one class of vessels from the other, nor is it always easy to do so. During 1776 seven vessels were employed chiefly in commerce.[d] In the fall

[a] Hening, Statutes of Virginia, IX, 103, 131-32, 202-08.

[b] Ford, Writings of Thomas Jefferson, II, 241-43.

[c] Journals of Virginia Navy Board, April 8, 1777.

[d] These vessels were the brig *Adventure*, the schooners *Hornet*, *Peace* and *Plenty*, *Revenge*, and *Speedwell*, sloop *Agatha*, and armed boat *Molly*. The lists of vessels here given were compiled from the Virginia naval archives.

most of them were ordered to the West Indies with cargoes of flour and tobacco; one, the brig *Adventure*, was directed to proceed to Dunkirk, France. The armed fleet for 1776 consisted of sixteen small craft adapted chiefly for service in the rivers of Virginia and in Chesapeake Bay.[46] In 1777 the galleys *Accomac* and *Diligence* were built and stationed on the Eastern Shore; and the ships *Caswell* and *Washington* were built at South Quay on the Blackwater for the defence of Ocracoke Inlet, which Virginia was undertaking jointly with North Carolina. Besides these four vessels, two brigs, one armed boat, and the ships *Gloucester*, *Protector*, *Dragon*, and *Tartar* were this year added to the navy. In 1778 an armed boat and the ships *Tempest* and *Thetis* were built; and in 1779 two armed boats, the brig *Jefferson*, and the ship *Virginia* were added.[47]

This fleet is formidable only in its enumeration. It was poorly armed, imcompletely manned, and in almost every respect illfitted for service. But few of its vessels went beyond Chesapeake Bay. It showed most activity during 1776 and the spring of 1777. From 1775 until 1779 fifteen small prizes were captured. In May, 1776, Captain Taylor seized four small merchantmen; in June one of the Barrons brought up to Jamestown the transport *Oxford* with 220 Highlanders on board; in the spring of 1777 the *Mosquito*, Captain Harris, carried into St. Pierre the ship *Noble* valued at 75,000 livres; and a few months earlier the brig *Liberty* captured the ship *Jane* whose cargo of West India goods were valued at £6,000. These were the most fortunate captures made by the Virginia navy.[48]

[46] These vessels were the galleys *Henry*, *Hero*, *Lewis*, *Manly*, *Norfolk Revenge*, *Page*, and *Safeguard*; the brigs *Liberty*, *Mosquito*, *Northampton*, and *Raleigh*; the schooners *Liberty* and *Adventure*; the sloop *Scorpion*, and the armed boats *Liberty* and *Patriot*. The schooner *Liberty* was taken into the trading fleet as the *Hornet*. It is believed that this list does not contain the vessels in Mason's Potomac fleet.

[47] The names of the vessels not mentioned in the text which were added during 1777, 1778, and 1779 were the brigs *Greyhound* and *Hampton*, and the armed boats *Nicholson*, *Experiment*, *Dolphin*, and *Fly*. The names of several other vessels, which were probably used in trade, occur during this period. Some of the ships are at times referred to as galleys.

[48] Files of Virginia Gazette; Journals of Virginia Convention, May 8, 1776; Virginia Historical Register, I, 77; Calendar of Virginia State Papers, III, 365.

Virginia's naval craft met with the usual misfortunes. During the first half of 1777 His Majesty's ship *Ariadne* captured the *Mosquito*. About the same time the frigate *Phoenix* took the *Raleigh*. The British made two raids into Virginia which were destructive to both the shipping of the state and private individuals. The first was ordered by Clinton in the spring of 1779, the troops being under the command of Matthews and Collier. At the Gosport shipyard they destroyed five uncompleted vessels, three of which were frigates, besides a large quantity of masts, yards, timber, plank, iron, and other ship's stores. The shipyards on the Nansemond were looted; and twenty-two vessels with a considerable quantity of powder were taken or destroyed on the "South Branch of the Navy." Suffolk was burned and upwards of two thousand barrels of Continental Pork and fifteen hundred barrels of flour were destroyed. In all one hundred and thirty vessels were burned."[11] The raid of Arnold and Phillips will be considered later.

The General Assembly at its May session, 1779, discontinued the Navy Board and vested its strictly naval duties with a newly created Board of War consisting of five members. The Board of War was empowered to appoint a Naval Commissioner. A Board of Trade was now given charge of the trading vessels of the state and of the state manufactories of military supplies."[12]

The General Assembly in its May session, 1780, "for the purpose of introducing economy into all the various departments of government, and for conducting the publick business with the greatest expedition" abolished the Boards of War and Trade, and authorized the Governor to appoint a Commissioner of the War, a Commercial Agent, and coordinate with these two a Commissioner of the Navy. This act is properly regarded as the outgrowth of the same movement for economy and efficiency in administration, which resulted in the establishment in January and February, 1781, of single-headed departments of the Continental Congress. The salary of the Commissioner of the Navy was fixed at thirty thousand pounds of tobacco a year, and that of his clerk at ten thousand pounds."[13] The Commissioner was

[11] Almon's Remembrancer, 1779, 289-95, account given by British officers; Records of State of North Carolina, XIV, 85-86, 94-95. Some of the vessels destroyed at Gosport probably belonged to Congress.

[12] Hening, Statutes of Virginia, X, 15-18, 123.

[13] Ibid., 278, 291-92.

to be under the "controul and direction of the governour and council." Governor Jefferson appointed James Maxwell, the naval agent under the Navy Board, Commissioner of the Navy.

At the October session of this year, moved by its need for money and the impossibility of fitting out the whole fleet, the General Assembly, ordered the governor to sell nine of the armed vessels and to equip and man the remaining six with all diligence. For some reason the governor did not carry out the order. There was probably little market for the vessels.

The General Assembly in the May session of 1779, as an inducement to enlistment, granted seamen and marines additional bounties and pensions. Recruits entering for the rest of the war were now to receive $750 and one hundred acres of land. They were to be furnished upon enlistment, and once a year thereafterwards, with a complete suit of clothes. Naval officers were entitled to a "grant of the like quantity of lands as is allowed officers of the same rank in the Virginia regiments on continental establishment." Disabled sailors and the widows of the slain were entitled to immediate relief and an annual pension."

The years 1780 and 1781 were marked by a renewed naval activity in Virginia. It is recalled that the theater of war had now shifted to the Southern states. Savannah was in the hands of the enemy. Charleston surrendered in May, 1780. By the fall of 1780 the lowlands of the states to the south of Virginia were generally in the possession of the British. Apparently Virginia would be the next to feel the rough hand of the conquering enemy. British privateers and naval craft lay off the mouths of the Virginia rivers and captured all the vessels that ventured towards the Bay or the sea. Early in 1780 it was apprehended that the enemy meditated an invasion of the coasts of the state.

When the General Assembly met in May, 1780, it at once took measures for the protection of the coasts. It passed "an act for putting the eastern frontier of this commonwealth into a posture of defence." This act after providing for calling out the militia in the seaport counties, ordered the Governor and Council to direct the Commissioner of the Navy to immediately make ready for service in the Bay and on the seacoast the ships *Thetis*, *Tempest*, and *Dragon*, the brig *Jeffer-*

" Hening, IX, 537; X, 23-24, 217.

son, and the galleys *Henry*, *Accomac*, and *Diligence*. Three hundred marines to be commanded by five captains and fifteen lieutenants were to be recruited. Marines and sailors who enlisted for three years were to receive a bounty of $1,000. Naval officers were put on the same footing in regard to pay, rations, and privileges as officers of the same rank in the land service."

When the Legislature came together in October, 1780, the situation being still more critical, it was moved to pass an additional act for the defence of the seacoast. This act shows that the navy was in sore need for seamen and money and it provided drastic measures to secure both. Naval officers were now authorized, under certain restrictions and limitations, to impress seamen. The eastern counties of the state were directed to bind to the sea "under the most prudent captains that can be procured to take them" one-half of all orphans of certain descriptions living below the falls of the Virginia rivers. A hospital for seamen was established at Hampton to be maintained by a tax of nine pence a month on the salaries of all mariners and seamen in either the navy or the merchant service of the state. Officers and seamen were given the whole of their captures; and still other inducements to enlistment, by way of pay and clothing, were held out.

Two new galleys of the same construction as those built by Congress in 1776 carrying two 32's at the bow and at the stern, and 6's at the sides, were ordered for the defence of the Chesapeake. Five vessels of the state fleet were to be immediately made ready for service; and all the other naval vessels were to be sold and the proceeds devoted to naval purposes. For the use of the navy import duties were laid upon rum, gin, brandy, and other spirits; on wine, molasses and sugar; and on all imported dry goods, except salt, munitions of war, and iron from Maryland. Tonnage was laid upon merchant vessels. Despite these efforts few seamen and little money were raised, and the fleet during 1780, accomplished almost nothing."

The salient event in the history of the Virginia navy in 1781 was the invasion of Arnold and Phillips during the first half of the year. Arnold was first reported on the coast of Virginia on December 29, 1780, when his fleet consisting of twenty-seven sail

[10] Hening, X, 296-99.

[11] Hening, X, 379-86.

was seen at Willoughby Point."[17] Governor Jefferson began at once to make strenuous efforts to get the Virginia fleet in condition to oppose Arnold. The rôle of Admiral was an odd one for Jefferson. In February, he sent Benjamin Harrison, Speaker of the Virginia House of Delegates to Philadelphia to obtain from the French minister the aid of the French fleet.[18] A half dozen or more privateers were taken into the service of the state. Twelve vessels of the state fleet of 1776-1779 still remained. Most if not all of these vessels were either at the Chickahominy shipyard and nearby on the James, or else at the mouth of the James. Few of these vessels were sufficiently manned to render much service. On April 26, Maxwell reported 78 men on board seven vessels, whose complement was 520. Other vessels had neither arms nor men."[19]

In April, 1781, Arnold and Phillips made their raid up the James, penetrating as far as Richmond. On April 21 and 22 a detachment under Lieutenant-Colonel Abercrombie destroyed the shipyard on the Chickahominy, including a number of naval craft and the warehouses. On April 27 at Osbornes, on the James a few miles below Richmond the Virginia fleet supported by two or three hundred militia upon the shore opposite the British army, drew up to oppose the enemy. It consisted of six ships, eight brigs, five sloops, two schooners, and a number of smaller craft. Its chief vessels were the *Tempest*, 16; *Renown*, 16; and *Jefferson*, 14. The British sent a flag of truce to the Commodore of the Virginia fleet proposing to treat with him for its surrender. He sent back the spirited reply that "he was determined to defend it to the last extremity." A few cannon planted on the shore soon gave the enemy a command of the situation. After a short engagement the Virginians scuttled or set fire to a number of their vessels and fled to the opposite shore. None of the fleet escaped. The British captured twelve vessels, which the Virginians had been unable to destroy. The British burnt the state rope-walk at Warwick. After the raid of Phillips, but one vessel remained in the Virginia navy, the armed boat *Liberty*."[20]

[17] Ford, Writings of Jefferson, II, 392.
[18] Ibid., 443-44.
[19] Virginia Calendar of State Papers, I, 588; II, 74.
[20] Almon's Remembrancer, 1781, II, 62-63. Arnold to Clinton, Petersburg, May 12, 1781.

The officers and seamen of the Virginia navy, thrown out of employment by the loss of their fleet, aided the allied forces at the siege of Yorktown in collecting supplies and transporting troops. The boat *Liberty* was used as a transport; and also the ships *Cormorant*, *Loyalist*, and *Oliver Cromwell*, which three vessels is it believed Virginia purchased for this purpose. Soon after the surrender of Cornwallis, the Virginia General Assembly, recognizing that "during the continuance of the present expensive war it is necessary to husband the resources of the state with the utmost economy," dismissed almost all of the officers and seamen, the Commissioner of the Navy, the chaplains, surgeons, paymasters, and all others on the naval staff.[1]

A number of times during the Revolution and now for the last time in 1782, Virginia and Maryland undertook to concert a naval defence of their trade in the Chesapeake. The General Assembly of Virginia, which met in May, 1782, appointed three commissioners to superintend the work of protecting the Bay. The *Cormorant* and *Liberty* were to be immediately prepared for this service. Two galleys and two barges or whaleboats were to be built. For this work the state appropriated the proceeds arising from the sale of the *Loyalist*, £1000, and certain tonnage and import duties. The Commissioners were to fix the pay and subsistence of the seamen; the fleet was not to be sent outside of the Capes.[2]

The Commissioners managed a small naval force during 1782 and 1783 until the war came to an end. Commodore Barron, stationed at Hampton, was chiefly occupied with the exchanging of prisoners. Beyond the building of a few naval craft, it does not appear that this final naval enterprise of Virginia was attended with fruitful results. When peace was declared in the spring of 1783 the Commissioners had in different stages of construction, the schooners, *Harrison*, *Fly*, and *Patriot* and the barges *York* and *Richmond*. Virginia now disposed of all of her fleet except the *Liberty* and *Patriot*, which she retained as revenue cutters.[3] In order to keep these two armed vessels in time of peace Vir-

[1] Hening, Statutes of Virginia, X, 450; Virginia Navy Papers, I and II.

[2] Hening, Statutes of Virginia, XI, 42-44. In March, 1783, the three Commissioners were Paul Loyall, Thomas Brown, and Thomas Newton, Jr.—Virginia Calendar of State Papers, III, 456.

[3] Virginia Navy Papers, II.

ginia in accordance with a provision in the Articles of Confederation, obtained permission from Congress.[84] These two boats were still in the employ of the state in 1787. The *Liberty* saw more service than any other state or Continental vessel of the Revolution. She was in the employ of Virginia from 1775 until 1787.

[84] Journals of Continental Congress, October 3, 1783.

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REMARKS ON SCREW PROPULSION.

By Assistant Naval Constructor R. D. Gatewood, U. S. N.

The question of screw propulsion, involving as it does the action and interaction of screw and ship, and a thorough knowledge of the true performance of the screw itself, has long and rightfully been considered the most baffling and abstruse problem presented to the naval constructor for solution. In the very beginning it seems complicated enough, but the further one goes into the subject the more involved does it become, and we are early led to believe with Sir William White that, "this difficult and complex subject, which has baffled investigation by the profoundest mathematicians can only be dealt with by experimental inquiry and scientific analysis,—and only then in the hands of the most able and competent men."

Such men have indeed attacked the problem and it is the purpose of this paper to summarize and discuss as briefly as may be the results of their respective theories, inquiries, and experiments.

The first theory of screw propulsion to receive much attention in the scientific world was that due to Rankine. Briefly, he reasoned as follows:

If the mass of water acted upon and the velocity imparted to it can be determined, the energy expended upon the water can at once be ascertained, and then, knowing the power developed by the engine, the efficiency of the screw propulsion can at once be obtained. In the above method the wasted frictional energy is entirely overlooked, as is also that due to "unnecessary disturbance" by the propeller.

For a number of years this theory was the only one, but early in the 70's William Froude brought forth his blade theory which has now come to be the standard for nearly all investigations upon

the action of the screw propeller. The determination of the action and efficiency of the screw by Rankine's method was extremely crude for two reasons, first because the mass of water acted upon could not be accurately determined, and second because friction of blade on water was neglected. In Froude's method the water acted on does not have to be known and the friction is allowed for. This does not mean to assert that Froude's method is perfect by any means. We can, however, say of it that it is consistent and that it is another way of looking at the question, another point of view, from which we are better able to make the allowances necessary to give us a better quantitative idea of the true conditions.

Froude's original article on the Elementary Relation Between Pitch, Slip, and Propulsive Efficiency begins with the assumption "that any theoretical treatment of the action of an actual screw in order to be sound, must rest on the principles embodied in the treatment of the plane." He then goes on to give the elements of his blade theory (a discussion of which may be found in the text books), and to describe the series of experiments on small flat plates from which it was deduced. These experiments, forming as they do the very foundation of the famous theory, are very interesting and instructive, but the scope of this paper is entirely too small to admit of an adequate discussion of them. It may be stated here that his two chief conclusions as a result of the flat plate experiments were: (1) that a much longer pitch than had generally been adopted was favorable to efficiency, and (2) that instead of it being correct to regard a large amount of slip as proof of a waste of power, the opposite conclusion was the true one. To assert that a screw works with unusually little slip is to give a proof that it is working with a large waste of power.

With these facts well in mind—facts which are now well known but which were but dimly understood or appreciated,—a series of model experiments were begun by the Froudes, father and son, to determine the efficiency of various forms of propellers and the practical applications of propellers to ships. Only the results of these very instructive experiments can be given here and the method in which the problem was attacked.

R. E. Foude (son) in his paper on "A Description of a Method of Investigation of Screw Propeller Efficiency" begins by dividing the subject into two entirely separate sections. The first deals

with the efficiency of the screw working by itself in undisturbed water, and the second, with the manner in which the above efficiency is affected by being brought into conjunction with hull of ship, or in short, with interaction of screw and ship.

Let V = speed of ship.

Let V_1 = speed (lower than V) at which screw will propel a "phantom ship" capable of resisting thrust of screw but creating no disturbance in water.

Let p = resistance of ship proper to speed of V apart from any effect of propeller.

Let T = thrust (greater than p by amt. = augmentation of screw, or wake gain, as it is now called).

Then E.H.P. $= pV$.

And T.H.P. $= TV_1$.

And Froude calls the hull efficiency the ratio of E.H.P. to T.H.P. or hull eff. $= \frac{E.H.P.}{T.H.P.} = \frac{pV}{TV_1} = \frac{p}{T} \times \frac{V}{V_1}$

$\frac{p}{T}$ = amount by which resistance is less than thrust = thrust deduction factor.

$\frac{V}{V_1}$ = excess of speed of ship over speed of screw thro' water in which it works = wake gain factor.

His conclusions are: (1) That the variation in the elements of hull efficiency with variation in speed is generally slight and so far regular that experiments on a model at a speed corresponding to the working speed of ship will be quite sufficient for all practical purposes; (2) that variation of number of blades or pitch ratio does not practically affect values of hull efficiency elements; (3) on other hand variation of screw diameter or of screw's position in reference to hull does affect these values, but that he was not able to tell in numbers just how much they were affected.

To determine the hull efficiency of any design of hull he first assumed the diameter and position of screw fixed by circumstances, such as draft, form of ship aft, depth of immersion, etc. Then he says that we have only to make one set of experiments with model screw (*any* screw of correct diameter) in correct position. We can thus determine the wake gain and thrust deduction factors (and their product, the hull efficiency) for the proposed shape of

hull and diameter and position of screw. We can then select the design of screw that will give with maximum efficiency the required thrust at a linear speed, which equals intended speed of vessel minus speed of wake. This will be the most suitable design of screw, and the product of its still water efficiency under these conditions into the wake and thrust deduction factors will give the total propulsive efficiency.

In another paper several years later on "A Determination of the Most Suitable Dimensions for Screw Propellers," he goes into this question much more in detail than as above described, and gives numerical results and curves by means of which the British Admiralty for a long time decided upon the propellers to be fitted to the various ships. As these curves and methods have long since been superseded by others more exact it is hardly necessary to describe them further. They were, however, for quite a number of years the standard of the British Admiralty.

There are several points in Froude's theory and methods that admit of some question but most of them are too involved to admit of a theoretical mathematical treatment. There was one, however, brought up by Mr. Thornycroft, that R. E. Froude treated in a separate paper and proved his point mathematically in the face of apparently impossible conditions for proof. In Froude's original treatment it was tacitly assumed that the water dealt with by the propeller in receiving imparted speed, suffered no permanent change in pressure from that of undisturbed water in which it originated. Otherwise his propositions do not hold. This is *incorrect* for a real screw, because as long as the race retains the spiral speed imparted to it, the pressure gradient from center to circumference must continue to exist, and since pressure *at* the circumference must be that of undisturbed water, the mean pressure within the column must be less. Thus the water in acquiring the imparted speed has at the same time been flowing in a region of reduced pressure, evidently thus lessening the thrust impulse necessary for imparting a given sternward speed and the work expenditure corresponding to the acquisition of that speed. After a very simple but ingenious mathematical treatment he finds that unless slip ratio and pitch ratio are high the effect of ignoring rotation suction is not very material.

The question of how the efficiency of the screw was effected by outboard and inboard turning was also gone into very thoroughly

by R. E. Froude. He found as a result of 21 experiments that inboard turning screws give perhaps 1.5 per cent greater efficiency than outboard; this does not apply to all ships, but only to those he investigated and these were warships. He conservatively says that it makes but little difference whether or not the screws turn in or out, and that the above experiments show this rather than that one way is more efficient than the other.

The Froudes investigated this subject much more fully than has been described above, but what has been said will at least serve to show the elements of their investigation and some of the most important results obtained by means of experiments.

Taylor's theory is merely a modification of Froude's blade theory and a very complete discussion of it may be found in his book, "Resistance of Ships and Screw Propulsion."

Still another theory has been proposed for dealing with this complex subject. It is due to Prof. A. G. Greenhill, an eminent mathematician, and is an attempt to look at the subject from a purely mathematical point of view. His paper in Vol. 29 of the "Transactions" is a most interesting one and it might be as well to see how different is his point of attack.

Where Rankine and other writers calculated the propulsive efficiency from the backward slip, leaving out of account as so much waste the rotatory motion imparted to the wake, Greenhill on the other hand leaves out of account the backward slip and determines the propulsive effect of screw propulsion as due to reaction of water to the rotatory motion imparted to it in the wake. Where in Rankine, Froude, and Cotterill the propulsive thrust is first calculated from the backward motion of the propeller wake and then the turning couple on propeller afterwards found, Greenhill reverses this order. The turning couple which he calls L is first calculated from angular momentum imparted to the wake, which is known, given any arbitrarily varying axial flow through propeller, and then the thrust on the thrust block is calculated from formulæ:

$$T\rho = 2\pi L.$$

Where T = thrust of screw in lbs. on thrust block.

ρ = pitch of propeller.

L = turning moment of engines on propeller in foot lbs.

The resulting formulæ that he arrives at are very much like those of Froude's and Rankine's but do not seem to give such good results in their practical application.

The various theories having been worked out quite completely it remained to substantiate their results by means of reliable tests made on propellers as large as possible working as far as possible in average conditions. As has been mentioned, R. E. Froude was perhaps the first to do this. Several others, among them Thornycroft, attempted similar tests with more or less satisfactory results, and later on, in this country, came Prof. Durand's experiments. But by far the most exhaustive and important experiments ever made in this subject are those of Naval Constructor D. W. Taylor, described in his recent paper before the Society of Naval Architects and Marine Engineers (S.N.A.M.E.).

The series of experiments covered 30 model propellers, 16 inches in diameter, three-bladed, of uniform pitch, diameter of hub $3\frac{1}{8}$ inches, thickness of center of blade at root $\frac{9}{32}$ inch and at tip $\frac{5}{32}$ inch. Six pitches were used, namely, 6.4, 9.6, 12.8, 16, 19.2, and 24 inches, and for each pitch five widths of blade used, the width ratios being .75, .125, .200, .275, and .350.

The primary object of the experiments was the determination of the power and efficiency of model propellers of the ordinary three-bladed type throughout range of pitch ratio and blade area likely to be found in practice. The low pitch ratio of .4 was used in view of present tendency toward increasing speed of revolution.

In Taylor's theory may be found the formulae:

$$P = .0093648\, Sd^2V^3.$$

Where P = power absorbed by propeller.
d = diameter of propeller in feet.
V = speed of advance of propeller in knots.

As a result of data obtained from his experiments he plots curves of efficiency and S which he calls the power co-efficient, and from these curves arrives at certain results, the most important of which are as follows:

(1) That it is possible to obtain even as high as 78 per cent efficiency with a propeller.

(2) That efficiency falls off steadily as pitch ratio is decreased.

(3) That as pitch ratio is decreased the influence of the area of the blade upon results becomes progressively less until for propellers of very fine pitch ratio the narrow blades actually absorbed the greater power.

For propellers of 0.6 pitch ratio, at a slip of 26 per cent, it makes practically no difference what the width of blade is, the same power is absorbed by the propeller altho' the narrower blades show a somewhat greater efficiency.

(4) As pitch ratio is decreased, the power absorbed and efficiency at low slips are both very great, the slip being based upon the conventional pitch which is that of the front of blade. For small slips the effective pitch would seem to be very much greater than nominal pitch as if the following portion of the back of the blade were predominant, whereas for large slips it would seem less again or as if leading portion of the back of the blade assumes predominance.

(5) That cavitation and all other phenomena of the action of a screw propeller are much more seriously affected by the shape of blade section, *i. e.*, by the back of the blade, than has heretofore been considered possible.

(6) And that in the above connection we should have as high a value of S as practicable in fine pitched propellers in order to keep down the diameter and so increase pitch ratio.

These experiments of Constructor Taylor's are the latest developments of the investigation of this very interesting subject, and so serve to bring to a close this paper the object of which, as before stated, was to show the methods used in dealing with the problem and where the question stands to-day.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

CONSIDERATIONS AFFECTING THE DETERMINATION OF A NAVAL PROGRAMME.

By Naval Constructor William G. Groesbeck, U. S. Navy.

The writer of the present article has long believed that one of the chief difficulties that has been encountered, in securing the assent of Congress to a definite ship-building programme for the navy, is the fact that naval opinion on the subject has been more or less chaotic, there being almost as many opinions on the navy's needs as there have been writers on the subject. This, coupled with the fact that most of the programmes that have been formulated have called for an extravagant navy, has, in the writer's opinion, caused the congressional naval committees to avoid a decision in the matter.

We have therefore gone on from year to year, securing ships in a haphazard manner. There have been years of stagnation in building, and years of plenty;—until finally we have obtained so many ships that we cannot expect to secure liberal appropriations in the future in the manner which has heretofore obtained. As long as the navy was obviously too small for our immediate needs, there was no difficulty about securing large increases, but now that, in the opinion of many laymen, this condition no longer exists, the question of how large a navy we are to build is becoming pressing. During the few years following the Spanish war, the press of the country was all in favor of the upbuilding of the navy. So also the people. There can be no question that Congress has liberally responded to the call for ships and men. Now, however, conditions are radically different, for not only is there a considerable question extant in the minds of the public as to how far it is proper for us to go in the development of our sea

power, but there is also the fact to be faced that of recent years the public revenues have been falling short of expenses, and we know that the navy has usually suffered first when economy was necessary. Unless, then, we can show cause why further increases are necessary, and *define the limits* of such increase, it appears to the writer that the next few years will see but few ships authorized. The importance of avoiding this state of affairs is sufficiently great, in the author's opinion, to justify this attempt at a discussion of the subject. It is hoped at the least that this paper will merit sufficient criticism to bring out the views of the service on the points at issue.

The question of how large a navy the country needs is, in the writer's opinion, susceptible of logical determination, the discussion involving a consideration of the following points:

(1) The effective strength of the navy when work now in hand is completed.

(2) The strength of certain foreign services.

(3) A comparison of the effective strength of the several services considered.

(4) The ultimate size of the navy.

(5) The yearly increase necessary to obtain and maintain the necessary effective strength.

Before discussing the above questions, which it is proposed to take up in succession, it is necessary to first define our unit of effective naval strength. It is, of course, the battleship; but there are battleships and battleships, and it is necessary to arrive at some equation by which battleships of one class and date may be compared with others of very different characteristics. As however this problem has engaged many able minds without satisfactory results, it is not the writer's intention to add another attempt to the long record of failures in this connection, but to make the comparison on more general grounds as stated below.

Battleships have been compared on the basis of displacement or battery power; on speed, or radius of action;—etc., each of these factors being assumed to be a certain proportion of the sum that represents the ultimate value of the ship. The trouble with such comparisons is that there is no way in which we can determine the relative value of these factors and be sure of arriving at a correct result, and the result being doubtful it hardly seems to be worth while to make use of these methods. More-

over, we must also recognize that the element of chance will play a large part in the result of an actual contest between any ships considered, so that on this score too great a refinement in classification is unnecessary.

The author's classification is based on age simply, although in the first instance he was inclined to emphasize, more than any other feature, that of speed, as it seemed to be evident that some of the older ships, in our own service particularly, are too slow to act with advantage with more recent types. As will be seen later on, however, the speed of ships has not very materially increased with increases of displacement, while offensive and defensive qualities have been continually increasing, and it seems therefore to be justifiable to make our classification solely on the basis of the time that has elapsed since the completion of each ship, that is, upon age.

Age will be recognized as bearing upon our subject in two ways. In the first place the modern battleship is the result of a process of evolution in design, each year having witnessed an increase in offensive and defensive power of individual ships. We are therefore confronted with the necessity if each year raising our standard of value; and it follows that the older a ship becomes the less will be her value on our ascending scale.

Of course, some ships are far ahead of their time in offensive and defensive power, others being far behind; and due regard should be given to this fact where it exists. As a general rule, however, we will not be far out in the average—and this subject must be handled on broad lines—if we arrange our ships on the basis of age simply. It may be remarked parenthetically that the loss in value of a ship due to improvements in later designs is far more important than that due to deterioration in material. Repairs and re-armament can postpone the day when a ship must be written off the list as useless; but however extensive such repairs may be the ship recedes in value nevertheless. The age of a ship then determines, within limits, her place in the scale of values on the effective list.

As bearing on our proposed programme, the age of a ship is also of interest, as there must be some age, determined by experience, at which a battleship becomes obsolete and requires to be replaced by a more effective unit. A wide difference of opinion seems to exist as to the exact figure—and probably in-

dividual instances will differ somewhat—as some ships are, by superior design, ahead of their time, and others, for converse reasons, behind it. The author has, after some cogitation, arrived at the conclusion that a battleship should be effective for sixteen years after the date of her completion. It would be desirable to retire them at an earlier date, say twelve years, if we had efficiency only to consider. But the author's aim has been to be most conservative in the deductions that follow and the more economical figure is therefore used.

One more point requires notice before we take up the first branch of our inquiry—which is, that battleships by themselves do not constitute a well-balanced navy. Many adjuncts to a battleship squadron are required, such as armored cruisers, torpedo flotillas, etc. These will, however, be ignored for the present, and our investigation as to the effective strength of the navy will be confined to battleship strength, both for the sake of clearness, and because the battleship is properly the only basis of strength.

We have adopted sixteen years as the limit of usefulness of a battleship, and it now remains to determine the relative value of the ship during the course of these years. The writer has adopted the convenient method of dividing all battleships into four classes and considers that for the first four years of a ship's life she has her full value. These ships are comprised in Class "A." After passing out of Class "A," ships enter Class "B," there to remain for four more years. Ships serving their third period of four years are considered as of Class "C," and the remaining four years of their service as of Class "D." It may be remarked that in the course of the sixteen years each ship may be expected to spend nearly two years out of commission in being overhauled and rearmed. This may be expected to occur about the end of the Class "B" service, or the beginning of the service in Class "C." This question will be further considered when we come to lay out our programme.

Neglecting the two battleships authorized at the last session of Congress, and considering that all the ships under construction will be completed in 1908, we will have at that date the following effective ships, classified as above described:

TABLE I.

Name.	Tons.	Speed.	Date Completion.	Date Retirement.
Class "A."				
New Hampshire	16,000	18.00	1908	1924
Vermont	16,000	18.00	1907	1923
Minnesota	16,000	18.00	1907	1923
Louisiana	16,000	18.00	1907	1923
Kansas	16,000	18.00	1907	1923
Connecticut	16,000	18.00	1907	1923
Idaho	13,000	17.00	1907	1923
Mississippi	13,000	17.00	1907	1923
Virginia	14,948	19.00	1906	1922
Rhode Island	14,948	19.00	1906	1922
New Jersey	14,948	19.00	1906	1922
Nebraska	14,948	19.00	1906	1922
Georgia	14,948	19.00	1906	1922
Class "B."				
Maine	12,846	18.00	1903	1919
Missouri	12,362	18.15	1903	1919
Ohio	12,500	17.82	1903	1919
Class "C."				
Wisconsin	11,653	17.17	1901	1917
Illinois	11,861	17.45	1901	1917
Alabama	11,703	17.01	1901	1917
Kentucky	11,724	16.90	1900	1916
Kearsarge	11,724	16.82	1900	1916
Iowa	11,275	17.09	1897	1913
Class "D."				
Massachusetts	10,200	15.5	1896	1912
Oregon	10,200	15.5	1896	1912
Indiana	10,200	15.5	1896	1912

The writer is aware that those who are so disposed can point out several minor errors in the above table, the classes having been made up with reference not only to the length of service of each ship, but also with a view of securing homogeneous grouping for the several classes. Certain liberties have also been taken with the dates of commissioning in several instances, it having been considered desirable, for the sake of clearness, to assign one date for all vessels coming out at about the same time. The dates at which several ships will retire according to the

author's sixteen-year limitation are given in this table, and err, if at all, on the side of conservatism.

Table I the author regards as particularly instructive, and proposes, before passing on, to dwell upon certain facts emphasized by it that seem to call for special notice. In the first place, many will doubtless question the prominent place assigned to the *Idaho* and *Mississippi*, holding that their slower speed should bar them from classification with the faster vessels of this group. The writer, however, after consideration, believes that the very powerful batteries carried by these ships render this classification correct, as unforseeable events "Incident to the service" are apt to make more than a knot's difference in speed between the slowest and the fastest ship of the 18 knot ships of this group, so that the *Idaho* and *Mississippi* may be able to keep up with them very well.

The table illustrates also the fallacy of the numerous complaints that have appeared from time to time in the pages of this publication relative to the lack of homogeneity in our fighting squadrons. It is true, that as at present distributed we are making no effort to keep our squadrons homogeneous. But it is evident that we have—or will have in 1908—two homogeneous units in our fleet in Class "A," one in Class "B" and one in Class "C," and if we recognize by that time the advantage of keeping homogeneous sister-ships together in squadron, there should be no cause of complaint on this account. Moreover, to the author's mind, we will be as well off in this respect as most other nations—to which reference will be made later on.

We also have in the table above referred to very clearly set forth the steady progress that has been made during the last twelve years in battleship design, which is, as has been stated, a matter of evolution. At the same time we are enabled to judge the value of recent attempts to fix the ultimate size of ships. We can trace a steady progress from 10,000 tons to 16,000 tons in our classes, with pauses at 11,500, 12,500, and 15,000 tons (roughly). Just at present it appears that we are to take another step forward to 18,000 tons for our next class. It is, to the writer's mind, logical to anticipate further increases—but he never expects to see a displacement reached which will satisfy *all* requirements and be the perfect ship, for as time passes naval opinion develops and changes, being subject to the same law of progress which

governs in the case of ship design. Indeed, the latter is but the expression of the former, and neither in one case nor the other can we anticipate finality.

* * * * * *

We are now in a position to consider the strength of certain foreign services, which forms the second part of our paper. It is obvious that the discussion can be confined to the navies of the following nations, viz.: England, France, Germany, and Japan. We omit the Italian navy, since the chances of our coming into contact with it are so very remote as to be negligible. The author does not wish to be understood as inferring that he considers the chances of a conflict with the others mentioned as more than a possibility, but we have with these powers many points of contact which *might* cause a conflict, and we must, in preparing our own navy, consider theirs. As to the Russian navy, it is at the present time an unknown quantity, no scheme for its rehabilitation having as yet been formulated, and we are therefore unable to appraise its future effectiveness.

The tables given below are based on the tables in Brassey's Naval Annual, corrected to date as far as information at hand permits.

ENGLISH NAVY—TABLE II.

Class "A."

Name.	Displacement.	Speed.	Completed.
Dreadnaught	18,000	21.00	1908?
Lord Nelson	16,500	18.00	1907
Agamemnon	16,500	18.00	1907
Hibernia	16,350	18.5	1906
Britannia	16,350	18.5	1906
Africa	16,350	18.5	1906
New Zealand	16,350	18.5	1906
Hindustan	16,350	18.5	1906
Dominion	16,350	18.5	1906
Commonwealth	16,350	18.5	1906
Edward VII	16,350	18.5	1906
Triumph	11,880	21.00	1905
Swiftsure	11,880	21.00	1905

Class "B."

Name.	Displacement.	Speed.	Completed.
Prince of Wales	15,000	17.5	1904
Queen	15,000	18.00	1904
Albemarle	14,000	18.90	1903
Cornwallis	14,000	18.90	1903
Duncan	14,000	18.90	1903
Exmouth	14,000	18.90	1903
Russell	14,000	18.90	1903
Montague	14,000	18.90	1903
Formidable	15,000	18.00	1902
Irresistible	15,000	18.00	1902
London	15,000	18.00	1902
Venerable	15,000	18.00	1902
Bulwark	15,000	18.00	1902
Canopus	12,950	18.25	1901
Glory	12,950	18.25	1901
Albion	12,950	18.25	1901
Goliath	12,950	18.25	1901
Ocean	12,950	18.25	1901
Vengeance	12,950	18.25	1901

Class "C."

Magnificent	14,900	17.5	1897
Majestic	14,900	17.5	1897
Prince George	14,900	17.5	1897
Victorious	14,900	17.5	1897
Cæsar	14,900	17.5	1897
Hannibal	14,900	17.5	1897
Illustrious	14,900	17.5	1897
Jupiter	14,900	17.5	1897
Mars	14,900	17.5	1897

Class "D."

Renown	12,350	18.00	1896
Empress of India	14,150	17.5	1893
Hood	14,150	17.5	1893
Ramillies	14,150	17.5	1893
Repulse	14,150	17.5	1893
Resolution	14,150	17.5	1893
Revenge	14,150	17.5	1893
Royal Oak	14,150	17.5	1893
Royal Sovereign	14,150	17.5	1893

FRENCH NAVY—TABLE III.

Class "A."

Name.	Displacement.	Speed.	Completed.
Patrie	14,865	18.00	1907
Republique	14,865	18.00	1907
Liberte	14,865	18.00	1907
Justice	14,865	18.00	1907
Verite	14,865	18.00	1907
Democratie	14,865	18.00	1907

Class "B."

Iena	11,861	18.2	1901
Suffren	12,527	18.00	1903

Class "C."

St. Louis	11,090	18.00	1900
Gaulois	11,105	18.00	1898
Charlemagne	11,108	18.1	1898
Bouvet	12,007	18.2	1898
Massena	11,375	17.1	1898
Charles Martel	11,693	18.1	1897

Class "D."

Carnot	11,954	17.86	1896
Jaureguiberry	11,637	18.07	1896
Brennus	11,190	17.10	1895

GERMAN NAVY—TABLE IV.

Class "A."

Name.	Displacement.	Sdeed.	Completed.
O	13,200	18.00	1908
P	13,200	18.00	1906
Deutschland	13,200	18.00	1906
Lohengren	13,200	18.00	1906
Preussen	13,200	18.00	1906
Hessen	13,200	18.00	1906
Elsais	13,200	18.00	1906
Braunschweig	13,200	18.00	1906

Class "B."

Schwaben	11,643	18.00	1903
Mecklenburg	11,643	18.00	1903
Zahingen	11,643	18.00	1903
Weltin	11,643	18.00	1903
Wittelsbach	11,643	18.00	1903

Name.	Displacement.	Speed.	Completed.
	Class "C."		
Kaiser Karl der Grosse	10,974	18.00	1900
Kaiser Barbarossa	10,974	18.00	1900
Kaiser Wilhelm der Grosse	10,974	18.00	1900
Kaiser Wilhelm II	10,974	18.00	1900
Kaiser Friedrich III	10,974	18.00	1900
	Class "D."		
Worth	9,874	17.2	1893
Weissenburg	9,874	16.00	1893
Kurfurst Friedrich Wilhelm	9,874	16.00	1893
Brandenburg	9,874	16.5	1893

JAPANESE NAVY—TABLE V.

Class "A."

Name.	Displacement.	Speed.	Completed.
A	16,500	18.00	1908
Kashima	16,400	18.5	1907
Katori	16,400	18.5	1907
	Class "B."		
Mikasa	15,200	18.6	1902
Ex-Orel	13,600	18.6	1902
Ex-Retvisan	12,700	18.00	1902
Shikishima	14,850	18.5	1902
Asahi	15,200	18.00	1902
Fuji	12,320	19.2	1902
	Class "C."		
Ex-Peresviet	12,674	18.00	1900
Ex-Pobieda	12,674	18.00	1900
Ex-Poltava	10,960	16.2	1900

The above tables do not seem to call for detailed comment. The English service is to be congratulated on having shown, perhaps, the most consistent progress in design. With the exception of the *Dreadnaught* and of the two ships *Triumph* and *Swiftsure*, built originally for another service, the speed of the ships in all classes does not vary more than a knot, so that, in this most important particular, *all* her ships are homogeneous.

Relative to the French navy, we notice the same uniformity of speed as obtains in the English service. Except, however, in

the case of the ships in Class "A" we do not notice the same homogeneity in the ships belonging to the same group.

The German list, with the exception of the *Brandenburg* class, which can really scarcely be called first-class ships, shows an absolute uniformity as to speed, but is marked by lightly armed ships throughout. The *Kaiser Karl der Grosse,* for example, with her four 9.4-inch guns and eighteen 5.9-inch guns can hardly be classed as the equal of the *Magnificent* of the English service, or the *Illinois* of our own, both of which have four 12 or 13-inch guns in their main batteries, and twelve 6-inch guns each. Also the *Wittelsbach* class, with a main battery of four 9.4-inch and eighteen 5.9-inch guns can hardly compare with the *Maine* of our service, and *Duncan* of the English service, which carry four 12-inch guns each, the *Maine* having sixteen six-inch and the *Duncan* twelve 6-inch. Again, the *Deutschland* and class, while approaching with their four 11-inch guns the heavy ordnance considered necessary by other nations, cannot with their fourteen 6.7-inch guns be classed with the four 9.2-inch and ten 6-inch of the *Dominion* class or the eight 8-inch and twelve 7-inch of the *Vermont* and class. No information as to the battery of "Q" and "R" of this service is at hand, which ships, however, will not be completed until 1909.

The table relative to the Japanese navy is doubtless incorrect in many particlars, but is compiled as carefully as possible from the data at hand. It supposes that the most optimistic view of salvage operations now underway will be justified by the event. Some question as to placing the *Orel* in Class "B" may be raised, as by age she belongs in Class "A." So also the *Fuji,*—by age she should be in Class "C," but the author considers that the Class "B" given consists of a homogeneous lot of ships which can act well together, and which correspond very closely with ships of other nations of the same date.

Before proceeding with an analysis and condensation of the above tables, it may be interesting to test the correctness of our classification by comparing ships of the same classes in a little more detail, and we will therefore, considering our own ships as the standard, observe how closely ships of other services, similarly classed, conform to their characteristics. In this connection, the following data are submitted.

We may admit, to commence with, that the ship *Dreadnaught*

of the English service, with her ten twelve-inch guns and 21 knots speed, is far superior to any other ship built or projected. She is not comparable with any other ship of any other service, and so stands in a class by herself. It should be pointed out, however, that this "splendid isolation" will somewhat impair her immediate value, as it will be some years before enough of these ships will be completed to form a squadron, which is the smallest unit that can be considered effective.

As to the balance of the English ships in Class "A," we have the following types:

Name.	Speed.	Displacement.	Coal Capacity.	Battery.
Lord Nelson	18.00	16,500	2000	4 12", 10 9.2"
Dominion	18.5	16,350	950*	4 12", 4 9.2", 10 6"

*Full load probably 1800 to 2000 tons.

These may be compared with the following ships in the American navy:

Name.	Speed.	Displacement.	Coal Capacity.	Battery.
Vermont	18.00	16,000	2200	4 12", 8 8", 12 7"
Rhode Island	19.00	14,948	1900	4 12", 8 8", 12 6"

Regarding the French navy, we do not find anything to compare with either of the groups in the above tables, the only type being

Name.	Speed.	Displacement.	Coal Capacity.	Battery.
Patrie	18.00	14,865	1825	4 12", 10 7.6"

In the German navy the *Deutschland* class does not compare very favorably with Class "A" ships in the English, American and Japanese navies.

Name.	Speed.	Displacement.	Coal Capacity.	Battery.
Deutschland	18.00	13,200	1600	4 11", 14 6.7"

The Japanese navy, while small in numbers represented, shows very formidably as to types. We have

Name.	Speed.	Displacement.	Coal Capacity.	Battery.
A	18¼	19,000*	?	4 12", 12 10", 12 4.7"
Kashima	18.5	16,400	?	4 12", 4 10", 12 6"

* Doubtful.

We come now to the ships in Class "B," for which one table will suffice.

TABLE VIII.

Class "B."

Navy.	Ship.	Speed.	Displacement.	Coal Capacity.	Battery.
English	*Duncan*	18.90	14,000	2000	4 12", 12 6"
	London	18.00	15,000	2000	4 12", 12 6"
United States	*Maine*	18.00	12,846	2000	4 12", 16 6"
France	*Iena*	18.2	11,861	1100	8 3.9" 4 12", 8 6.4"
Germany	*Wittelsbach*	18.00	11,643	1450	4 9.4", 18 5.9"
Japan	*Mikasa*	18.6	15,200	1520	4 12", 14 6"

We may compare Class "C" ships thus:

TABLE IX.

English	*Majestic*	17.5	14,900	2200	4 12", 12 6"
United States	*Illinois*	17.45	11,861	1200	4 13", 14 6"
France	*Bouvet*	18.2	12,007	621*	8 5.5", 8 3.9" 2 12", 2 10.8"
Germany	*Kaiser Class*	18.00	10,974	1000	4 9.4", 18 5.9"
Japan	*Ex-Peresviet*	18.00	12,674	2056	4 10", 11 6"

* Probably normal.

It hardly seems worth while to draw up a table for the Class "D" ships,—both because of the short while they are still to be considered effective, and because they differ so widely in type.

We are now, in the light of the preceding tables, in a position to appraise the value of our age classifications. It may be repeated, that we have not been endeavoring to compare the ships by assigning to each characteristic a certain value and ascertaining the value of the ship therefrom. We have merely attempted—and with some success—to gather the ships of the several nations into groups of which the units in the different navies are approximately equal, and which may, from similarity of design and approximate length of service, be expected to pass off the effective list at about the same time.

As regards the navies of Great Britain, Japan, and the United States, the writer believes that this has been accomplished, as the similarity of types of the same dates is rather remarkable through the first three classes. We cannot say the same thing, however, as regards the French and German services. In the light of recent events in the Far East, and the consequent movement towards the adoption of the opinion that guns of 6-inch and 7-inch calibers and less are useless, except for torpedo attack, it must

be conceded that the *Patrie* class of the French navy (Class "A") and the *Deutschland* class of the German navy (Class "A") will be very little more effective when completed than are to-day the *Maine* class in the United States navy and similar ships in the navies of England and Japan. Since however ordnance is continually improving, and these ships will doubtless have weapons superior to those installed at the present time, the author believes that to adhere to our original grouping will be both justifiable and conservative.

We may now return to our original tables which we will condense and re-arrange, as follows:

TABLE X.

Date.	U. S.	England.	France.	Germany.	Japan.
		Class "A."			
1908	1	1	..	2	1
1907	7	2	6	..	2
1906	5	8	..	6	..
1905	..	2	..	..	..
Group Totals	13	13	6	8	3
		Class "B."			
1904	..	2	..	..	..
1903	3	6	1	5	..
1902	..	5	..	..	6
1901	3	6	1	..	..
Group Totals	6	19	2	5	6
		Class "C."			
1900	2	..	1	5	3
1899	..	..	..	..	..
1898	..	..	4	..	..
1897	1	9	1	..	..
Group Totals	3	9	6	5	3
		Class "D."			
1896	3	..	2	..	..
1895	..	..	1	..	..
1894	..	..	..	..	..
1893	..	8	..	4	..
Group Totals	3	8	3	4	0
Grand Totals	25	49	17	22	12

The above table is interesting as showing that in 1908 our only close rival for the second place in the race for naval supremacy will be Germany, and considering the unquestioned supremacy of our own ships, individually, over those in this navy, and the preponderance we will have in the higher classes, we can see the reason for the remark in Brassey's Naval Annual for 1904, that "the United States will shortly become the second naval power of the world."

* * * * * * *

The writer now proposes to carry on the tables given above and to observe how the positions of the several nations are affected by the passage of time, consideration being given to the effects of the naval programmes of other nations, so far as they have been announced. In order to conform to our classification, it will be necessary to assume an arbitrary interval of time required to complete a ship from its "laying down," and this interval has been fixed by the writer at four years, uniformly.

It is true that the English require less, and that the Japanese, who build largely in England, are in the same position; and that the French require rather more. Four years, however, seems to be a fair figure, and as accurate a one as it is necessary to employ. As to the advantage of the English and Japanese, we will consider that they employ the margin of time at their disposal at the inception of the work,—they being thus enabled to take advantage of the successful features in the designs of their rivals, and correct their mistakes; and to meet sudden increases in foreign fleets with an equal number of ships at least equally good.

The English have a definite building policy, but not a definite building programme. We will not, then, be able to forecast their action accurately. The writer does not believe that she will build as freely as of former years, but considers that it is by no means probable that she will allow any nation to outbuild her, year by year. In the absence of a Russian programme, and in view of the enormous preponderance, ship by ship and class by class, that she has over the French and Germans, the writer has used as her programme the completion of three ships each year, which he believes will be rather less than the facts will show.

The German programme is based on a total of 38 ships to be completed in 1917, the present ships to be replaced when they have reached the age of 25 years. It does not seem necessary to

argue that to retain ships until this age has been reached will require more expenditure in the way of repairs and rearmaments than the ships will be worth, considering their enormous inferiority with subsequent designs. However, that is the present proposition, and accordingly the Germans will complete ships as follows (Brassey's Naval Annual, 1905, assuming a four-year construction period):

1909	2	additional ships.	1916	1	substitute ship.
1910	2	substitute "	1917	1	" "
1911	2	" "		1	additional "
1912	2	" "	1918	1	substitute "
1913	2	" "	1919	1	" "
1914	1	" "	1920	1	" "
1915	1	" "	1921	2	" "

It should be noted in this connection that the 38 ships allowed will require not only the *Brandenburg* class but such minor ships as the *Oldenburg* and the *Baden* class to be considered effective for some time to come. By discarding these, the writer does not consider that he is underestimating the effective force of the German service in 1908, although the total of ships is correspondingly decreased. In the following tables the author has introduced the effective list given in Table IV and has used the programme above stated.

The French programme is more difficult to forecast, since no definite statement of the same appears to have been made. The Superior Council recommends thirty-four ships, to be completed in 1919. They have, according to the Office of Naval Intelligence, 19 first-class battleships completed, whereas according to Brassey's they have only 17 completed or projected, of which but 11 are completed. Assuming that the 19 ships referred to are to be counted, we have a total of 25 already authorized, and nine still to be laid down. As it is probable, however, that the necessity of replacing the older ships will be recognized at an early date, it will be more nearly correct to consider that only the 17 ships referred to in this article as effective are to be counted, which will leave 17 to be laid down by 1915.

The Minister of Marine, in the Budget of 1905, asks for six homogeneous battleships, to be laid down later. We will, in the absence of better information, assume that they will be completed as the rate of 2 each year, commencing in 1910, and that

a steady rate of progress will be maintained until 1919, which will provide 18 ships.

Relative to the Japanese programme, not much can be said. The relative poverty of that country, together with the recent alliance with England, which will to a large extent remove the pressure of necessity, will probably keep the programme down to something less than a ship each year. The author has allowed, as the Japanese programme, two ships in three years.

We will now carry forward our Table X up to and including 1920, using the programmes already outlined, first assuming that no more ships will be built by the United States. The writer does not believe that such a contingency confronts us, but it is desired to show how evanescent in that case would be the great naval power that we are about to attain, and how fallacious are the arguments that because we are now largely increasing our force, no further increases are necessary.

Table XI, below, will show at a glance the progress from year to year of the several powers considered, on the basis stated in each case:—

TABLE XI.

Date.	U. S.	England.	France.	Germany.	Japan.
1920	..	3	..	1	..
1919	..	3	2	1	1
1918	..	3	2	1	1
1917	..	3	2	2	..
	—	—	—	—	—
	..	12	6	5	2
1916	..	3	2	1	1
1915	..	3	2	1	1
1914	..	3	2	1	..
1913	..	3	2	2	1
	—	—	—	—	—
	..	12	8	5	3
1912	..	3	2	2	1
1911	..	3	2	2	..
1910	2	3	2	2	1
1909	..	3	2	2	1
	—	—	—	—	—
	2	12	8	8	3

We may now trace, through the tables given above (Nos. X and XI), the relative positions that the several powers will occupy from year to year, under the programmes assumed, it being sufficient for our purposes to make the comparisons at four-year intervals. From Table X we would have in 1908 the following standing of the Powers:

TABLE XII.

In 1908 Rank.	Nation.	Class A.	Class B.	Class C.	Class D.	Total Effective.
1	England	13	19	9	8	49
2	United States	13	6	3	3	25
3	Germany	8	5	5	4	22
4	France	6	2	6	3	17
5	Japan	3	6	3	..	12

The unquestionable claim which the United States will hold in 1908 on the second place is plainly evident from this table. We notice an overwhelming superiority over all powers but England in the modern ships of Class "A," while in the other classes we can almost match France, Germany and Japan, individually, ship for ship.

The situation, however, changes somewhat in 1912, as the following table will show:

TABLE XIII.

Rank.	Nation.	Class A.	Class B.	Class C.	Class D.	Total Effective.	Grand Total.
1	England	12	13	19	9	53	61
2	Germany	8	8	5	5	26	30
3	United States	2	13	6	3	24	27
4	France	8	6	2	6	22	25
5	Japan	3	3	6	3	15	15

It will be observed that in 1912 the United States will have fallen to third place, having two less effective ships than Germany and three less altogether. As regards France, we would still be somewhat in the lead as regards numbers. It should be noted, however, that both France and Germany would have eight Class "A" ships to our two, and it may thence be safely argued that if the Class "A" ships projected are as superior to the ships forming Class "B" as the *Dreadnaught* is to the *Vermont*, the superiority of the German navy will be unquestioned, and that of

the United States over France doubtful. We conclude, then, that by resting contented with our present fleet, we will drop in 1912 from second place to a questionable third.

Continuing, we will have in 1916:

TABLE XIV.

Rank.	Nation.	Class A.	Class B.	Class C.	Class D.	Total Effective.	Grand Total.
1	England	12	12	13	19	56	73
2	Germany	5	8	8	5	26	35
3	France	8	8	6	2	24	33
4	United States	..	2	13	6	21	27
5	Japan	3	3	3	6	15	18

This table calls for no special comment, since the extremely bad fourth place that the United States will occupy will be evident at a glance.

The situation will be even worse in 1920 as Table XV will show. The writer does not, frankly, believe that this table is of the slightest value, as fifteen years is too far ahead to make even a close approximation of the situation possible. It is given, however, as it may be of interest in completing this line of argument.

TABLE XV.

Rank.	Nation.	Class A.	Class B.	Class C.	Class D.	Total Effective.	Grand Total.
1	England	12	12	12	13	49	85
2	France	6	8	8	6	28	39
3	Germany	5	5	8	8	26	40
4	United States	..	..	2	13	15	27
5	Japan	2	3	3	3	11	20

Before concluding this part of the discussion and passing to our fourth division, the ultimate size of the navy, a few reflections on the comparison of the several services considered may be pertinent.

Relative to the programmes outlined above for France and Germany, it may be said that we have probably underestimated the programme of the German Navy, and overestimated that of France. It is possible that the Germans will shortly increase their programme, this project being already in the air. While nothing is definitely known as to the form the new programme will take, it will be interesting to assume that the sixteen-year

limit of usefulness is to be adopted, and that ships having reached this limit are to be replaced. The French, on the other hand, are not apt to adopt the extensive programme outlined for them in its entirety, from financial considerations, it being well known that that nation is already near its limit of expenditure. Since, however, we cannot assume that the French will allow their sea power to become markedly inferior to that of Germany, it seems better to accept the programme as stated than to indulge in speculations which from the uncertainty of the problem must be of doubtful value.

It will be interesting also to trace the effects if the United States builds enough ships from year to year to replace those that drop out, on the sixteen-year basis, the total amounting to somewhat more on an average than one ship each year.

The tables below show the modified programmes of the United States and Germany and the comparative standing of the powers on the assumptions stated.

TABLE XVI.

	United States.	Germany.
1920	1	3
1919	1	2
1918	2	2
1917	2	3
	6	10
1916	..	3
1915	1	2
1914	1	2
1913	1	3
	3	10
1912	1	3
1911	2	3
1910	2	3
1909	..	3
	5	12

TABLE XVII.

Standing in 1912:

Rank.	Nation.	Class A.	Class B.	Class C.	Class D.	Total Effective.	Grand Total.
1	England	12	13	19	9	53	61
2	Germany	12	8	5	5	30	34
3	United States	5	12	6	3	27	30
4	France	8	6	2	6	22	25
5	Japan	3	3	6	3	15	15

In 1916:

Rank.	Nation.	Class A.	Class B.	Class C.	Class D.	Total Effective.	Grand Total.
1	England	12	12	13	19	56	73
2	Germany	10	12	8	5	35	44
3	United States	3	5	13	6	27	33
4	France	8	8	6	2	24	33
5	Japan	3	3	3	6	15	18

In 1920:

Rank.	Nation.	Class A.	Class B.	Class C.	Class D.	Total Effective.	Grand Total.
1	England	12	12	12	13	49	85
2	Germany	10	10	12	8	40	54
3	France	6	8	8	6	28	39
4	United States	6	3	5	13	27	39
5	Japan	2	3	3	3	11	20

It will be observed that we have improved the situation of the United States somewhat, while the German navy has been placed in a position of unquestionable superiority over every nation except England.

The above comparisons are interesting, both *per se*, and as illustrating the method by which, using the author's tables, the strength of fleets may be compared on any assumptions that may be advanced. It will be shown later on, however, that the programme stated for the United States is inadequate; and since this paper is designed to deal with conjecture as little as possible, the German possible programme will be discarded in favor of her present programme, as previously stated.

* * * * * *

In taking up the fourth part of our discussion, "The Ultimate Size of the Navy Required," it will be readily appreciated that the subject is a difficult matter to handle, although a satisfactory

method of approaching it is obvious. It would be a simple matter to review the policies of the United States in the West Indies and South America and in the Far East; then to select those powers whose interests in these localities may clash with ours; and thence to determine the size of the navy required to ensure a satisfactory result should a conflict ensue. Since, however, too free a discussion of this nature would be manifestly indiscreet, it does not seem to be desirable to undertake it, and as the author does not know any other definite method of arriving at the desired result, he is obliged to fix the number of ships he believes to be adequate from a general consideration of the position of the United States and its needs with reference to sea power. Afterwards, the resulting navy will be compared with the others described above, with a view to determining its sufficiency.

The United States, fortunate above all powers in being self-contained and self-supporting, has only two external policies which affect its vital interests and from which consequently serious friction with foreign powers is apt to follow. These are, obviously, the Monroe doctrine, and the open door in the Far East.

Neither of these require to be defined. Nor does the author believe that at this day extended arguments are required to demonstrate the necessity of our being in a position to enforce them. The Monroe doctrine we have inherited, and, by virtue of being the one cardinal principle of our political relations with other nations through succeeding generations, has become so much a part of our national life, that the temper of our people will require its support regardless of the means available for the purpose, as history has demonstrated.

The open door policy is a more recent acquisition, and means simply that while we have no intention of acquiring more territory in Asia, we do not intend to allow any portion of the continent to be closed to our products. Whether or not this doctrine is of enough importance to justify our going to war in its support remains to be seen. The necessity, however, of securing access to the enormous trade in the East for our surplus products is undoubtedly of enough consequence to warrant us in maintaining a sufficient force in those waters to ensure our representations being treated with respect.

Considering, then, that the need of being able to support these doctrines is evident, the author proposes below a navy sufficient

in numbers to make an attack upon them an extremely hazardous adventure, but, on the other hand, not so large that the consciousness of power will tempt us lightly to undertake a war.

It is proposed to provide additional ships until a standing force of sixteen vessels can be maintained on the Atlantic coast, and eight in Asiatic waters. A further fleet of eight ships is also proposed to be available after the Panama Canal is completed, to reinforce either of the other squadrons as occasion may require. This will make a total effective force of 32 ships. To these the author proposes to add four more, this number being necessary to replace those that are from year to year undergoing the extensive modernizing and re-arming after eight years of service that has been previously referred to. This would give us a total of thirty-six ships, of which nine are still to be authorized, and we may pass to the arrangement of the programme by which they are to be obtained, leaving until afterward the consideration of the adequacy of the number proposed.

We will return to the programme given in Table XVI, in which the United States replaces ships that pass the sixteen-year limit only, and see what increases from year to year are necessary to bring the number of ships up to the limit we have just defined. It is desirable, in order to equalize appropriations, to distribute their construction as far as practicable, bearing in mind that they will all be wanted in 1916, by which time we may expect the canal to be in operation. The author believes that this may be best accomplished by altering the previous table (No. XVI) as follows:

TABLE XVIII.

Year.	No. of ships.	Year.	No. of ships.	Year.	No. of ships.
1920	1	1916	3	1912	2
1919	1	1915	2	1911	2
1918	2	1914	2	1910	4*
1917	2	1913	2	1909	..
	—		—		—
	6		9		8

*Two authorized in 1905 here included.

With the increases allowed above to the United States, the standing of the powers would be as follows:

In 1912: TABLE XIX.

Rank.	Nation.	Class A.	Class B.	Class C.	Class D.	Effective ships.	Grand Total.
1	England	12	13	19	9	53	61
2	United States	8	13	6	3	30	33
3	Germany	8	8	5	5	26	30
4	France	8	6	2	6	22	25
5	Japan	3	3	6	3	15	15

In 1916:

Rank.	Nation.	Class A.	Class B.	Class C.	Class D.	Effective ships.	Grand Total.
1	England	12	12	13	19	56	73
2	United States	9	8	13	6	36	42
3	Germany	5	8	8	5	26	35
4	France	8	8	6	2	24	33
5	Japan	3	3	3	6	15	18

In 1920:

Rank.	Nation.	Class A.	Class B.	Class C.	Class D.	Effective ships.	Grand Total.
1	England	12	12	12	13	49	85
2	United States	6	9	8	13	36	48
3	France	6	8	8	6	28	39
4	Germany	5	5	8	8	26	40
5	Japan	2	3	3	3	11	20

We will repeat here, for convenience, the standing of the powers in 1908 (Table XII) as follows:

1908:

Rank.	Nation.	Class A.	Class B.	Class C.	Class D.	Effective ships.	Grand Total.
1	England	13	19	9	8	49	..
2	United States	13	6	3	3	25	..
3	Germany	8	5	5	5	22	..
4	France	6	2	6	3	17	..
5	Japan	3	6	3	..	12	..

A casual inspection of Table XIX will reveal that we will not be in 1908 a near, and cannot hope to become, a close rival of England for supremacy at sea. The English will have in 1908 and 1912 nearly twice as many ships as we can muster. And while this ratio is not maintained in 1916, the proposition very nearly holds good. Matters are more nearly equalized in 1920, but as

has been stated before, the time is too far in the future to permit us to draw any valuable conclusions relative thereto. Any of my readers who are interested in the matter can easily determine from the above tables the programme necessary to bring our navy up to that of England in strength at a given time. It would be, however, so wildly extravagant and so utterly beyond our needs, that no time will now be spent in its consideration.

In comparing the proposed strength of the United States Navy with that of Germany, France and Japan, we are met with the difficulty that we are obliged to separate our standing squadrons so that we cannot fairly assume that our whole force would be available for use against any one of these powers. If we could foretell the outbreak of hostilities a sufficient time in advance, we could concentrate our forces in whatever direction it might seem necessary. As it is, however, we are compelled to divide our fighting ships; and although the larger proportion are required in the North Atlantic, our needs in the Far East require a considerable force in Asiatic waters. We are, therefore, under the liability of being beaten in detail before a concentration could be brought about, as for example, were the Russians in the recent war. The Panama Canal will be of vast advantage to us in this connection after it is available, but until then and to a less extent later on we must adopt the obvious remedy—that of maintaining sufficient squadrons on both stations.

The accepted proposition at present seems to be three ships on the North Atlantic to one in Asia, and the writer's programme has been arranged somewhat with a view to maintaining this proportion. In 1908 our interests will require us to maintain about eight of our twenty-five ships in Asia, leaving about 17 for service on the North Atlantic. This would enable us to meet France ship for ship, though placing us somewhat behind Germany, supposing that either nation were to attack us with all their effective force. The writer would have no fear for the result in either case, however, since we have a considerable number of monitors and other secondary ships which will still in 1908 be of some service. Moreover, it is possible that we might be able to reinforce our North Atlantic fleet by some of the ships in Asia, where we will have, as regards Japan, a respectable, but not a preponderating force.

We may, therefore, conclude that the ships at present author-

ized and approaching completion do not form an extravagant fleet, considering the manifest needs of the country.

Passing to the year 1912, the situation will be almost exactly the same, if the proposed programme is carried out. We will then have thirty ships available. Of these 16 would form our North Atlantic fleet and 8 our Asiatic fleet. The remaining ships, including those under repair, would form the nucleus of our reinforcing fleet, amounting, probably, to a division of four ships.

As opposed, then, to a possible twenty ships on the Atlantic coast, Germany could muster twenty-six ships, according to her present programme and thirty ships if her possible programme (Table XVII) is authorized. Since, however, these numbers include such relatively inferior ships as the *Wittelsbach* and *Kaiser* classes, the result would probably not be disastrous; although it should be noted that at this date the United States could expect but little aid from the assortment of monitors, etc., that she will then possess.

France would be able to bring against us 22 ships, which would about equal our own twenty, in the author's judgment.

As regards Japan, we could oppose her 15 ships with 12, supposing our reinforcing division to be in eastern waters.

Again the absence of extravagance in the author's programme, as regards 1912, may be pointed out.

Going on to 1916, our fleets would be brought up to the full numbers asked for, and we will assume that they are distributed as stated above,—16 on the Atlantic coast, 8 in Asia and 8 to be used on either station.

Against our 24 ships on this coast, France can muster 26, as can also Germany, according to her present programme. Our programme, therefore, still produces practical equality as against these two powers. As against Japan also, we would be practically equal, 16 ships to 15, if our reinforcing fleet were in Asiatic waters. The situation is very little altered in 1920 as a comparison will show.

Our programme will, therefore, be seen to be just barely sufficient to ensure us an even chance of success in the event of hostilities with any of these powers. It will be noticed, doubtless, that the German possible programme would completely alter the situation, and that we would need additional ships to meet her

fleet if it is authorized. Since, however, the author's aim has been to determine the *minimum*, rather than the *maximum*, number of ships which must be built, it has seemed best to ignore the possible increase in the German programme as only a possibility. And the author believes that this may safely be done, since it will always be possible to increase our own programme to keep step with increases in those of our rivals.

From all of the above, it is considered that the least number of ships that should be authorized from year to year is properly stated below,—the table being a repetition of Table XVIII with the four-year construction period subtracted.

TABLE XX.

1905	*2 additional ships.	1911	2 additional ships.
1906	2 " "	1912	3 { 1 " " ; 2 substitute ships.
1907	2 { 1 " " ; 1 substitute ship.	1913	2 substitute ships.
1908	2 substitute ships.	1914	2 " "
1909	2 { 1 " " ; 1 additional ship.	1915	1 " "
		1916	1 " "
1910	2 additional ships.		

*Authorized.

* * * * * *

Having expressed, as above, a battleship programme, which will, in the author's judgment, adequately meet the needs of the service, but not more than meet them, this essay must pass to a consideration of our requirements as regards the other classes of ships necessary to a well-formed fleet; and this consideration must necessarily be brief, owing to the limited space remaining.

A review of the several Navy Lists will reveal that besides battleships of the first class, almost an indefinite number of types of ships have from time to time been built; these types having been evolved for reasons that at the time seemed to be governing. It will be hardly worth while to even mention the majority of these types, as naval opinion has generally discarded them as useless, and it is not believed that they will be repeated.

There remain, however, a limited number of types which are still considered necessary by the leading naval powers, and these types we cannot ignore if our proposed fleet is not to be greatly

hampered in its operations by their absence. The types to which the author refers are:

1. Armored cruisers.
2. *a.* Protected cruisers. *b.* Scout cruisers. *c.* Gunboats.
3. Torpedo vessels.

It would be entirely practicable with each of these classes to institute an inquiry as to the position of the United States as regards the other naval powers, similar to that given above for battleships, and thence deduce the number of ships, to be built for our own service, and the consequent programme.

Unfortunately, however, such a course would not, in the author's judgment, be determinative, since it would necessarily ignore the fact that naval opinion in this country and abroad has not become settled on the subject of the relative functions and value of these types. Moreover, as the battleship fleet is unquestionably the ultimate measure of strength, it would be necessary to fix the numbers of the auxiliaries more with reference to the number of battleships than by comparison with the numbers possessed by our rivals, and naval opinion has not yet crystallized out on the proper proportions of the several types to the number of battleships.

We must, therefore, proceed on other lines, and the writer has, after much cogitation, reached the conclusion that the most satisfactory method is to assume that as it at present exists (except as regards torpedo vessels), the navy is sufficiently strong for all practical purposes. On this basis it will only be necessary to provide for replacing ships as they become decrepit, improving the several types or developing new types from time to time as existing naval opinion may demand. This course will advantageously remove from the discussion the many controversial questions which have been pointed out, and will moreover guard the programme ultimately determined from the charge of extravagance, which the author has particularly desired to avoid. This course the author has accordingly followed.

Taking up the armored cruiser class, it will be necessary, in order to arrive at a proper conception of the subject, to first examine briefly the standing of the United States as compared with the other powers considered. Armored cruisers have recently

become so powerful that they will in future undoubtedly be expected to take some part in general engagements; and so costly that it is questionable whether it will not in the future be better to divert all funds available for armored cruisers to the construction of battleships, there being but little difference in the cost of the types. The author believes that in the absence of any definite solution of this question, it will be the part of wisdom not to overdo the building of armored cruisers, but at the same time not to allow the United States to fall too far behind in this most important branch of its naval power.

The following table is compiled from Brassey's Naval Annual, and gives, for the several naval powers considered, data of all cruisers which are in Brassey's opinion, sufficiently modern and effective to warrant their being listed as of the first class. The author has some doubts as to continuing the *New York* and *Brooklyn* on this list, owing to the age of these ships, and regards the three *St. Louis* class as exceedingly bad investments from the point of view of military efficiency. The other lists, however, contain ships whose value is equally doubtful. The author has moreover considered it necessary to extend Brassey's list to include the *Columbia, Minneapolis* and *Olympia*, on account of the speed or batteries of these ships, which renders them still of some value for certain purposes, and which would undoubtedly result in their being called into active service should hostilities break out in the near future.

TABLE XXII.

England.

No. of ships in class.	Class Name.	Speed.	Displacement.	Battery.	Coal.
3	*Defence*	22.5	14,600	4 9.2″, 10 7.5″	
6	*Black Prince*	22.5	13,500	6 9.2″, 10 6″	2000
4	*Drake*	23	14,100	2 9.2″, 16 6″	2500
6	*Cressy*	21	12,000	2 9.2″, 12 6″	1600
6	*Devastation*	22¼	10,850	4 7.5″, 6 6″	1600
10	*Kent*	23	9,800	14 6″	1600
8	*Diadem*	20.5	11,000	16 6″	1000
2	*Powerful*	22	14,200	2 9.2″, 16 6″	3000
45					

United States.

No. of ships in class.	Class Name.	Speed.	Displacement.	Battery.	Coal.
4	*Washington*	22	14,500	4 10", 14 6"	2000
6	*Pennsylvania*	22	13,680	4 8", 14 6"	2000
3	*St. Louis*	22	9,700	14 6",	1500
1	*Brooklyn*	21.9	9,215	8 8", 12 5"	1622
1	*New York*	21	8,200	4 8", 10 5"	1334
2	*Columbia*	22.8	7,375	1 8", 2 6", 8 4"	1670
1	*Olympia*	21.7	5,870	4 8", 10 5"	1074
18					

*Germany.**

1	*D*	Not Known	Not Known	Not Known Not Known	Not Known
1	*C*	22½	11,319	" "	"
2	*Roon*	21	9,350	4 8", 10 5.9"	1800
1	*Prince Heinrich*	20½	8,759	2 9.4", 10 5.9"	1500
2	*Prince Karl*	20½	8,858	4 8.2", 10 5.9"	1500
1	*Furst Bismark*	19	10,570	4 9.4", 12 5.9"	1000
8					

* Six additional ships may be authorized which would bring the total up to 14.

France.

3	*Ernst Renan*	23	13,427	4 7.6", 16 6.4"	2250
4	*Victor Hugo*	21	12,350	4 7.6", 16 6.4"	2100
4	*Gloire*	21	9,856	2 7.6", 8 6.4"	1590
3	*Dupetit Thomas*	21	9,367	2 7.6", 8 6.4"	1600
1	*Jeanne D'Arc*	21	11,092	2 7.6", 14 5.5"	2000
15					

Japan.

2	*Asama*	21.5	9,700	4 8", 14 6"	1409
2	*Iwate*	21	9,750	4 8", 14 6"	1412
2	*Adzuma*	20, 21	*9,500	4 8", 12 6"	1275
2	*Kasuga*	20	7,700	1 10", 2 8", 12 6"	1150
8					

* Approximate.

Attention is next invited to Table XXIII, in which the total number of first-class battleships available in 1908 is compared with the total number of first-class cruisers given in the previous table, it being a reasonable assumption that all of them will have been completed by this date.

TABLE XXIII.

Nation.	Effective Battleships.	Armored or 1st class cruisers.	Per cent of battleship strength in cruisers.
England	49	45	91.8
France	17	15	88.2
United States	25	18	72.0
Japan	12	8	66.6
Germany	22	8	36.4
		14	63.6

From this table we see that the United States possesses about an average percentage of first-class cruisers in proportion to its battleship fleet. It should however be noted in this connection that both England and Japan propose to build armored cruisers in the near future and that the German Government hopes to have six additional armored cruisers authorized this year.

We may then safely say that the United States will not be in 1908 any too strong in first-class cruisers, and the author believes that the necessity, at the least, for replacing ships as they pass off the effective list will be clearly recognized by even the most rigid economist.

Obviously, we may confine our investigation to the five older ships at the bottom of the list, since the others are of very recent date and we need not consider replacing them within the period covered by this discussion.

The author proposes that these ships should be replaced as follows:

TABLE XXIV.

Name.	Completed in	To be retired in	Ships to be authorized to replace in
New York	1893	1913	1909
Brooklyn	1896	1916	1912
Columbia	1894	1914	1910
Minneapolis	1894	1914	1910
Olympia	1895	1915	1911

It will be noted that the sixteen-year age limit has been departed from in the case of three of these vessels, the limit having been extended to twenty years. This the author has done in recognition of the extensive overhaulings that have been authorized on these ships, or which will shortly have to be authorized unless their retirement is imminent. The proposition to replace

the *Columbia, Minneapolis* and *Olympia* by two modern ships will generally, it is believed, be recognized as erring, if at all, on the side of conservatism.

It should be pointed out in connection with this modest programme that the ships to be provided will commence to become available in 1913, by which time the *Washington* class of armored cruisers will be far from first-class ships in comparison with such ships abroad, and the Pennsylvania class still less so. The necessity of having about this time at least one squadron of the most modern of armored cruisers would in the author's judgment be a paramount justification for the ships proposed, even in the absence of the argument for their construction that has been presented.

* * * * * *

A very similar line of argument can be followed with reference to protected cruisers, which the author proposes shall be replaced by scout cruisers. This type is undoubtedly a necessity to our fleet in the absence of merchantmen of high speed which we might arm in case of necessity for scouting duty; and is in this respect the logical successor as a type to the moderate-sized, medium-speed, protected cruiser, now more or less antiquated, of which we possess a considerable number.

The author presents below a table in which is given the names and dates of completion and retirement of certain of these vessels, and the programme proposed to replace them, assuming a two-year construction period. To err again on the side of conservatism, the author has assumed that the three *Salem* class scouts replace three of the earliest to retire. It is not believed that there can be any well-informed objection on the score of prematureness to the retirement dates given in this table, which are figured on the sixteen-year basis, modified as the condition of individual ships seem to require. It may be said of these vessels, in the author's judgment, that had they been borne on the English navy list, the large majority of them would have probably been already discarded as of no military value. The table follows:

TABLE XXV.

Protected or unprotected cruiser.	Completed in	Retired in	Scouts to be authorized to replace in
1. *Atlanta*	1886	1902	1904 Salem.
2. *Boston*	1887	1903	1904 Chester.
3. *Philadelphia*	1890	1906	1904 Birmingham.
4. *Baltimore*	1890	1906	1906
5. *San Francisco*	1890	1906	1906
6. *Newark*	1891	1907	1907
7. *Chicago*	1889	1909	1907
8. *Detroit*	1893	1909	1908
9. *Marblehead*	1894	1910	1908
10. *Montgomery*	1894	1910	1909
11. *Cincinnati*	1894	1910	1909
12. *Raleigh*	1894	1910	1910
13. *New Orleans*	1898	1914	1912
14. *Albany*	1900	1916	1914

It will be noted that the programme has not been written strictly in accordance with the assumptions stated above. This is for the reason that although we are to-day behind what our programme should be if we had commenced our reconstruction in time, the author believes that better results will be obtained by adopting a uniform programme of two ships a year, than could result from authorizing three ships this year, one next year, none the next, etc. Care has, however, been taken in no case to anticipate the date at which a ship will be required.

* * * * * *

Gunboats form no part of the military fleet of any sea power, but to ourselves, equally with the others, they are necessary in order to permit the proper performance of our duties of international police.

The author submits without argument a table giving the names of the gunboats that will shortly require to be replaced, and the programme necessary to this end:

TABLE XXVI.

Gunboats.	Completed in	Retired in	Gunboats authorized to replace in
Topeka	1887	1903	1906
Petrel	1889	1905	1906
Yorktown	1889	1905	1907
Bennington	1891	1907	1907
Concord	1891	1907	1908
Machias	1893	1909	1908
Castine	1894	1910	1909
**Don Juan de Austria*	....	....	1909
**General Alava*	....	....	1910
**Isle de Cuba*	....	....	1910
**Isle de Luzon*	....	....	1911

* Captured vessels, information not available.

* * * * * *

Relative to torpedo vessels, but little need be said. We are credited on the navy list with sixteen destroyers and thirty-five torpedo boats. These numbers will be universally recognized as very small in comparison with the number of such vessels possessed by the other first-class powers, and as altogether too small to meet our reasonable requirements.

The torpedo service in our navy has unquestionably suffered in the past through indifference both in the service and on the part of the general public. This the author believes to have been due to an underestimation of the value of these vessels.

The author has heard it said that during the late war between Japan and Russia, the Japanese torpedo vessels did not succeed in sinking any Russian ships except the *Sevastopol* and that in the case of this vessel there was no particular need of their doing so. It being admitted that the Japanese handled their torpedo craft with consummate skill, the argument follows that such vessels are of no value, and hence that the United States has shown wisdom in not building them in recent years and consequently that no more should be built.

This line of argument the author believes to be entirely fallacious, since it ignores the fact that the Japanese torpedo service played a large and determining part in the campaigns. In the first place, in the opening engagement of the war, the Russian fleet was driven into the harbor of Port Arthur by destroyers

with three ships out of action (whether from torpedoes or other causes). In the second place, at the battle of the Sea of Japan the torpedo attacks during the night engagement prevented the Russians from reorganizing their scattered forces, while the main Japanese squadron were enabled to dispose themselves to the best advantage for the next day's work.

If then the Japanese met with no direct successes with torpedoes (and it is not yet clear that this is the case), it seems evident that they were nevertheless amply repaid for the relatively small cost of their torpedo fleet. Entirely aside from this argument it seems comparatively clear that the incessant watchfulness and strain to which a fleet will be subjected when operating in waters in which they are liable to be attacked by torpedo vessels will be a factor of the first importance; and the author does not believe, considering the small cost of imposing this disadvantage on an enemy, that the United States can afford to neglect making ample provision for doing so. Accordingly the author has added to his programme three torpedo boat destroyers each year, which he believes will be recognized as the least number that we can afford to accept if our torpedo service is to be in any way satisfactorily developed.

* * * * * *

Finally, the following table is presented in which the various component parts of the programme proposed are brought together for convenient reference:

TABLE XXVII.

Year.	Battleships.	Armored Cruisers.	Scouts.	Gun-boats.	Destroyers.
1906	*2 additional ships.	.....	2	2	3
1907	1 " "	.....	2	2	3
	1 substitute "	.....			
1908	2 " "	.....	2	2	3
1909	1 " "	1 substitute ship.	2	2	3
	1 additional "				
1910	2 " "	1 " "	1	2	3
1911	2 " "	1 " "	..	1	3
1912	1 " "	1 " "	1	..	3
	2 substitute "				
1913	2 " "	.....	..	..	3
1914	2 " "	.....	1	..	3
1915	1 " "	.....	..	..	3
1916	1 " "	.....	..	..	3

*Two additional authorized, 1905, but not commenced. Not here included.

In submitting this paper the author desires to point out that there are classes of ships other than those discussed which would, if available, tend to increase the efficiency of the fleet. As, however, this paper is not intended as a theoretical discussion of an ideal programme, these types have not been called for. The paper has been prepared in the hope that ultimately a definite building programme may be authorized; and since the signs of the times point distinctly towards a rigid scrutiny of the need for such increase of the fleet rather than in the direction of liberal appropriations, it seems clear that the only sort of programme we can hope to establish will be one that rigorously excludes all types of ships that we can possibly do without; and further, that provides the least numbers of the necessary types consistent with a reasonable safety.

Relative to the programme here proposed, the writer apprehends that even the modest number of ships called for will be obtained with difficulty, although he has endeavored throughout to avoid the introduction of unnecessary units. It is hoped, therefore, that such discussion as this paper may invite will tend to a reduction of the programme rather than towards its increase.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE DAWN OF NAVIGATION AND ITS BOOKS, THEORIES AND INSTRUMENTS.

By Thomas G. Ford.

In the middle ages there lived a number of French rhymesters in whose forgotten verses there are many interesting facts and lessons relating to the seaman's art. Chief and earliest among these was Guillaume de Lorris, born in the Gâtinais in Provence, author of the first part of the celebrated "Roman de la Rose,"[2] which appeared in the latter part of the thirteenth century. He was the originator of the art of poesy in France, as well as of the peculiar style of metrical writing of that day, and the "Roman de la Rose" became in time the oracle and the inspiring model for all the young poetasters of the succeeding centuries. The main topic of this "roman" was the "Moral Philosophy of Love," then a favorite subject of discussion among grave philosophers and theologians, as well as among sentimental students of literature. Indeed this poem was written in an age when the civilized world was much occupied in making war or love, in both of which arts the sailor has always borne a conspicuous part. We find him therefore quite at home in the mediæval "romans" of France and Italy, which were composed in rhymed verse in the quaint Romance language that preceded the modern tongue of each of those nations. They were generally mystical, allegorical and satirical, personifying all

[1] This is the first of a series of articles, entitled as a whole "The Beginning of Events Nautical and Naval," which form the introductory chapters of a "History of the U. S. Naval Academy," perhaps more properly to be called a "History of Naval Education," written some years ago by Mr. Thos. G. Ford, a professor of English at the Naval Academy 1858 to 1865. The manuscript of this work was recently deposited in the library of the Naval Academy, and the author has kindly consented to the publication of such parts of it as seem to the Board of Control of the Institute likely to interest readers of its Proceedings.

[2] "Fabliaux et Contes des Poètes Français, des 11-14 siècles," Paris, 1813.

the virtues and vices of humanity, and teaching philosophy in seductive verse. They were also prolix to an extraordinary degree, which was endurable, says Sismondi, in the days when "a single volume in manuscript was the treasure of a whole mansion."[3]

The authors of some of these early "romans" must have been very familiar with marine affairs, as we find in the "Roman de la Rose" (written expressly for the Normans, who were nearly all sailors or the sons of sailors) in the "Roman de Brut," in the "Roman de Tristan," and in the "Chroniques des Ducs de Normandie," stirring descriptions of wrecks, storms and battles at sea, piratical expeditions, and sudden descents upon an enemy's coast. But none of these writers makes any mention of the compass as a guide to navigation. Jal,[4] in his painstaking review of these "romans," establishes this fact, and attributes to Guillaume de Lorris, in the "Roman de la Rose"[5] the earliest mention of the polarity of the magnet and its application to navigation. Herein lies the chief interest for us of the first part of this "roman," which made it an acknowledged authority upon the subject throughout Christendom. Guillaume de Lorris was more commonly known as "Guyot de Provins, the Provençal Poet," and his part of the "Roman de la Rose" by the title of "la Bible," given to it by the author himself, who declared that it contained nothing but the truth. A professional troubadour or strolling minstrel, Guyot spent the early years of his life in travel through France and Germany, welcomed at every baronial castle for his brilliant talents

[3] The whole of the "Roman de la Rose" contains 22,732 lines. In the course of time the length of such descriptive poems was much diminished. The greatest event of the 10th century was described by the Abbé Pajol, in his "Poème sur la Bataille de Lepanto," in 184 strophes of eight lines each. In the last century, Falconer wrote his wonderful story of the "Shipwreck" in 2686 lines.

[4] Auguste Jal "Archéologie Navale, Paris, 1840.

[5] The original manuscript of the "Roman de la Rose" on vellum, adorned with curious miniatures, is preserved with great care in the "Bibliothèque Nationale" at Paris. In the Bibliothèque Cantonale at Lausanne, Switzerland, there is a very old manuscript copy in Gothic letter, difficult to decipher, and without title page or date of publication, but it is supposed to be of the first half of the fourteenth century. Other manuscript copies were made later, containing alterations of the original text, to make it correspond with the improving French language and manners of the day. The earliest printed editions are those of 1503, 1527 and 1529, at Paris. The best printed version is said to be that of Abbé Lenglet, Amsterdam, 1737.

and gay spirits. He afterwards made the customary pilgrimage to Jerusalem by sea and land, in the suite of a prince, not however as a crusader, as he had no taste for arms or for the life of a soldier. Indeed he made a jest of his lack of physical courage, preferring, as he said, a life without glory to the most enviable death in battle. His weapon was the pen, his spirit that of the man of peace, which fitted him admirably for the treatment of his favorite subject. Not until his declining years, however, was he able to devote himself to it. Then, weary of the world and its beauties, he sought the seclusion of monastic life at Clairvaux and Cluny successively, where he employed the leisure hours of twelve years, previous to his death (in 1260 or 1262), in composing his famous "Bible." Under an allegorical emblem, the Rose, typifying Wisdom or a state of grace, and without a single personality, the genial monk and poet eulogized all that was good and true in the world of his day, and denounced unsparingly the vices and abuses of the age, among which he singularly specifies "the unheard of venality of legists and medicists in selling their scientific knowledge for filthy luere."

This part of the "Roman de la Rose" might have better stood alone as a fine poetic and moral conception of the art of spiritual love as understood by the philosophers. It was the fitting work of an elderly sentimental scholar wearing a monk's habit. But, in the first decade of the next century, Jean de Meung,[8] a brilliant young courtier, was commissioned by his royal master, Philip Augustus of France, to continue the "roman" of Guyot, and he did so, treating the subject from a widely different point of view, and in a most cynical, licentious spirit to the very end of the second part of the work. He became the most learned man, and most vindictive satirist of his day, and he seemed to revel in writing what Fauchet characterized as "bloody satire upon every-

[8] Jean de Meung, surnamed "Clopinel" from a defect in his gait, was born at Meung sur Loire about 1280. He finished his part of the "Roman de la Rose," containing 11,597 lines, previous to 1305, while still a very young man. De Meung also translated from the Latin into French "La Consolation de la Philosophie" de Boëce, le livre de Végèce "de la Chevalerie," le livre "des Merveilles de Mirlande," le livre "des épitres de Pierre Abeillard et Heloise," et le livre d'Aelred "de spirituelle Amitié," all dedicated to the king Philip le Quart. Later he dedicated his book entitled "Le Dodecaedron" to Charles V., who reigned over France from 1364, so that De Meung was then about 84 years of age, and a contemporary of Dante, Petrarca, and Boccaccio.

thing that was respected in his time." Nothing could be more dissimilar, says the critic, than the two poets and the two poems—the one was chaste, sentimental and rather stilted in style, after the manner of monastic writing; the other was a gross, cynical picture of contemporary life, with less poetry and truth, but more learning. Both parts of the "Roman de la Rose," for different reasons, were well calculated to win for their authors great fame in France and Italy, and the plagiarized imitation of the poem in old English, under the same title, by Geoffrey Chaucer, made it known to the English reading public of his day.

De Meung's work, however, exercised a baneful influence upon French literature by popularizing a low standard of taste and morals. Indeed the general tone of the troubadour poetry was vulgar, and it was not until Dante and Petrarca had spiritualized the poet's art that its capacity for sublime creations was felt and recognized in France and Italy. After them, the licentious productions of the troubadours gradually lost their charm and were forgoten. It is a singular fact, however, that the men who then followed the sea escaped the biting satire of these cynical rhymesters.. Perhaps there was a tender spot in the poetic soul of that day, as there is even now, for the weather-beaten mariner so well described by Shakespeare, in his "Pericles," as

> "A man whom both the waters and the wind,
> In that vast tennis-court, hath made the ball
> For them to play upon."

Certainly he was not neglected in mediæval literature, as we find him and his art made a favorite subject by the poets, and in musical verse that pleases even the exacting ear. This gift of versifying the difficult language of the sea—so rare in modern times—was possessed in an eminent degree by the troubadour poets. Indeed, Jal affirms that the rhythmical treatment of nautical subjects, by those early writers, proves that the sea language, however corrupted in the vocabulary of sailors, is essentially poetic in its origin, with a freshness and life-coloring peculiar to itself.

It is in a rhythmical dress, in the "Bible de Guyot," that we find the earliest description of the loadstone and needle, as first applied to navigation in the twelfth century. Although the very imperfect instrument there described had been used by Arabian mariners on the Syrian coast long before Guyot's time, he doubtless first saw it on board the vessel that bore him to Palestine. He regarded it,

too, as the miracle of the age, worthy of celebration in story and song. Hence his enthusiasm when, interrupting the course of his allegorical narrative, he thus, in old-time French, describes the north star and the great mystery.

"Molt bien la voient
Li marinier qui s'i avoient;
Par cele estoile vont et viennent
Et lor sen, et lor voie tiennent:

Ils l'apelent la tresmontaigue.
Icile estaiche est molt certaine
Toutes les autres se removent
Et rechangent lor lieus et tornent;
Mais cele estoile ne se muet.
Un art font qui mentir ne puet

Par la vertu de la manière:
Une pierre laide et brunière,
Où li fers volontiers se joint

Ont; si esgardent le droit point.

Puis c'une aguile i ont touchié

Et en un festu l'ont couchié
En l'eve la metant sans plus,

Et li festuz la tient desus:
Puis se torne la pointe toute
Contre l'estoile si sanz doute
Que ja nus hom n'en doutera
Ne jà por rien ne fausera.

Quand la mer est obscure et brune

Con ne voit estoile ne lune

Dont font a l'aguile alumer
Puis n'ont il garde d'esgarer.

Contre 'estoile va la pointe
Por ce sont li marinier cointe
De la droute voie tenir.
C'est un art qui ne peut faillir."[1]

"Right well they see it
The mariners whose guide it is;
By this star they go and come
And their course and their way do keep:
They call it the polar star.
This guide is most certain.
All the others move
And change positions and turn;
But this star moves not.
An art they make, that cannot deceive,
By the power of the magnet:
A stone ugly and brown,
To which iron spontaneously is drawn,
They have: observing the right point.
After they have touched it with a needle
And in a straw have placed it
They put it in water without other support,
And the straws keep it afloat:
Then it turns its point direct
Towards the star so surely,
That no man can doubt it,
Nor will it ever for anything prove false.
When the sea is covered with darkness,
And neither star nor moon is seen,
They place a light by the needle
And then have no fear of going astray.
Toward the star the needle points
Whereby the mariners make sure
Of keeping the true course.
It is an art which cannot fail."

[1] Jal copies these lines, in his "Archéologie Navale" from Meon's edition of the "Fabliaux et Contes des Poètes Français des 11-14 siècles, Paris, 1813." Le Grand d'Aussy and other editors, quoting from altered texts of the poem, give a slightly different version of them.

This was afterwards called the "Song of the Compass"—the gem of the whole poem—which acquired celebrity among the litterateurs and savants of that day, and which, it is asserted by Le Grand d'Aussy, Guyot himself was accustomed to sing for the delectation of his brethren in the monastery of Cluny. It was the first pean of praise composed in honor of the sailor's trusty guide and companion.[8] It may have been chanted also by pilots and crusaders as they sailed along the Mediterranean shores. This would have been quite in accord with the romantic minstrel spirit of the age which animated men of all conditions afloat and ashore. The sailor was then, as now, a lover of song and sea-lore, and among the inspiring subjects of his calling, none could have appealed to him more forcibly than the mysterious magnetic needle.[9] It was destined too, to create a confidence in himself and in his art, entirely unknown to the mariner of earlier periods who had nothing but the north-star to guide him on the deep.

"Ere men the virtue of the magnet found,
The ocean scarcely heard a human sound,
For western suns were deemed to shine in vain,
Or only light the monsters of the main.
The seas were narrow which the boldest crost,
And numbers trembled if the shore were lost.
Now a far world incites the liquid race,
And oceans vast our intercourse increase.
The use we know, but haply ne'er shall find
Whence to the pole the magnet is inclined;
How a dark heavy stone the earth supplies,
Maintains a correspondence with the skies;
How it imparts to steel the art it knows,
Yet keeps entire the virtue it bestows:

[8] Before the introduction of the compass, Norwegian navigators, in their long voyages, determined the vicinity of land by the flight of crows which they took with them. These birds flying high could see land if any were in sight, and the pilot was guided by the direction of their flight.

[9] The loadstone was known by many different names which were in some cases used also to designate the first imperfect compass, such as "magnes" in Latin (the origin of the English word "magnet"); "calamita" in Italian, "pedra de Iman" in Portuguese; "pedra di Cevar" in old Spanish; and "manette" or "marinette," "manière" or "marinière" in French, according to the requirements of meter. The French words were either a corruption from the Latin, or were of the technical language of seafaring people, signifying probably, the sailor's companion—a very appropriate designation.

Long may the needle feel the art divine,
To show the pathless way and wat'ry line;
Pointing the steersman straight o'er convex seas,
Whose mere extent were else a clueless maze;
For, foam the ship tow'rds tropic, line or pole,
The compass seems her brain, tho' art's her soul." [10]

But in these and even more primitive times we find evidences of nautical skill and of successful navigation of the narrow seas,[11] under the sole guidance of the stars, which influenced more or less the lives and fortunes of various classes of men. The sailor, however, was more than all other men bound up in the heavenly bodies. "They were to him guide, companion, and warning, and we are not surprised to learn that the introduction of the first rude floating compass did not wean him for long time from his implicit trust in the stars." Indeed, if Virgil is to be believed, sailors were the first to give names to the stars—"Navita tum stellis numeros et nomina fecit" (Georgics).

A later song of the compass than Guyot's, in three couplets, extracted from a French manuscript of the fourteenth century by M. Francisque Michel, is quoted by Jal, but it so nearly resembles that of the Provençal poet, that he pronounces it a mere imitation of the original one. It must be added that Guyot's lines bear such an impress of truth and energy as to leave no doubt in any reasonable mind of the great fact they enunciate. But the rude imperfect instrument he describes was probably used at first only when the heavens were clouded, and it could not have been of much utility except in calm weather, being incased in a bit of straw or rush, floating in an urn full of water that was disturbed at every motion of the ship. Bailak Kibdjaki, an Arabian writer, thus describes, in 1242, the manner in which the needle was magnetized by his countrymen: [12]

[10] Extract from J. Kirkpatrick's "Sea Piece"—a poem in five cantos, published in London in 1750.

[11] The curious reader will find in the Cosmography of Aethicus Hester, translated into Latin before the 7th century, by a certain Jerome, a priest, many interesting details of the construction and handling of the ancient ships of the north, of the Caspian sea, and of the Grecian archipelago. Jal refers to this work.

[12] In the 13th century there were in Italy students of Arabian sciences, such as Leonardo Fibonacci of Pisa, a great traveler, who wrote the first treatise on algebra in 1202, and a treatise on geometry in 1220, and greatly contributed to the introduction of Arabic numerals.

"We have to notice amongst other properties of the magnet, that the captains who navigate the Syrian Sea, when the night is so dark as to conceal from view the stars, which might direct their course according to the position of the four cardinal points, take a basin full of water; they then drive a needle into a wooden peg or cornstalk so as to form the shape of a cross, and throw it into the basin of water, on the surface of which it floats. They afterwards take a loadstone of sufficient size to fill the palm of the hand, or even smaller; bring it to the surface of the water, give to the hand a rotary motion toward the right, so that the needle turns on the water's surface; they then suddenly and quickly withdraw the hand, when the two points of the needle face North and South. They have given me ocular demonstration of this process during our sea voyage from Syria to Alexandria in the year 640 of the Hegira."

In these floating compasses described by Guyot and Bailak, there is clearly foreshadowed the principle of the liquid compass of the present day, without the accessories that make the latter so valuable an instrument. It was the great oscillation of the compass card in a seaway that led an ingenious Englishman to propose, in 1799, the filling of the compass bowl with some sort of liquid.

If additional evidence were wanted of the existence and use of a floating compass at the period in question, it could be found in the forgotten works of other mediæval authors, such as the treatises "De Utensilibus," and "De Natura Rerum" of Alexander Neckham, the English monk and schoolmaster, a contemporary of Guyot, who described the floating magnet in a ship at sea; the "Histoire de Jérusalem," by Cardinal Jacques de Vitry; and the writings of Gauthier d'Espinois, Albert le Grand, and others. De Vitry describes the needle thus: "Une aiguille de fer, après qu'elle a touché le diamant, se tourne vers l'étoile du Nord, qui comme l'axe du ciel, reste immobile pendant que se meuvent les autres étoiles. D'où cette pierre est très nécessaire à tous ceux qui naviguent sur mer." That this fair-weather compass was known in the thirteenth century to Roger Bacon and other learned men in England is evident from the testimony of Brunetto-Latini given elsewhere, although no English mariner could then be induced to use it at sea.

Another mediæval poem, treating incidentally of the sea and sailors, is entitled "Documenti d'Amore," written by Francesco

da Barberino,[18] the founder of the great Italian family of the same name lampooned in the familiar Pasquino epigram "Quod non barbari fecerunt, Barberini fecere." He became a favorite pupil of Brunetto-Latini and made such progress in his studies that while yet in his minority he was able to discuss publicly twenty-four propositions of moral philosophy. He afterwards studied jurisprudence, filled the important office of notary public, was the first doctor of law appointed in Avignon, became a famous pleader in the courts of Florence, traveled by sea and land within the limits of Europe, and finally settled down in the gay Tuscan capital to write the great work of his life.

This celebrated poem, in old Florentine rhyme, commenced in 1290, was completed in the beginning of the fourteenth century, and treats of the virtuous and vicious features of love—from which, in Barberino's judgment, all good and evil proceeded—the subject being evolved in a series of twelve lessons to moral philosophy as then taught. So much wisdom is contained in this masterly effort to reform the morals of his age, and such is its literary merit, that it was considered the very best production of that early epoch of Italian verse. It was held in high repute by the academicians of La Crusca for the melody and originality of its metres, as well as for the wealth of words and expressions it contributed towards the formation of the Italian language.

It is in the ninth lesson—"Nono Documenti d'Amore sotto Prudenza"—that the poet treats exclusively of the seaman's art as illustrating the virtue of prudence—very necessary in all early navigation—and here there is displayed such knowledge of the details of the art, of the magnetic needle (calamita), and of the customs of maritime life as could be possessed only by an enthusiastic lover of the sea. So perfect is the nautical technique of this ninth "Documento" of 382 lines, that one of his biographers expresses the opinion that Barberino must have cruised at sea himself and obtained from some of the expert mariners of Pisa or Leghorn points on navigation. Jal declares it to be "a most excellent nautical lesson." It is a compendium of the practical sea-

[18] Barberino was born in 1264, in Barberino, a castle of the Valdelsa, and died of the plague in Florence in his 84th year (1348). His great work, "Documenti d'Amore," remained in manuscript in the Vatican library until 1640, when it was published in quarto, with a sketch of his life, a portrait, several engravings, and some minor poems.

manship of that day, antedating by nearly two and a half centuries the publication of what is considered the earliest text-book of the seaman's art—the work of the Portuguese, Pedro Nunez.

It is to be understood, however, that the term seamanship is used here in a very limited sense, as applied to inshore sailing and to a class of vessels of simple construction and manipulation. But little advance had been made in the seaman's art since the days of the Greeks and Romans, and of the sciences forming the ground work of navigation, not much was known in Barberino's time. The only nautical novelty of his day was the introduction of the floating compass, the importance of which he proclaimed in stirring verses. Previously the mariner hardly knew whither he sailed, the knowledge of his situation was derived from the land which he tried to keep in sight, and his course was regulated by the heavenly bodies which sometimes led him into danger. So he seldom ventured far out to sea. Not even the period of the year for safe navigation was left at the discretion of captains or owners of trading vessels, the rule prescribed being thus expressed by Barberino:

"Tempo di navigare	"The time for navigation
D'April dei cominciare,	Thou should'st begin from April,
E poi sicuro gire	And then safely go to sea
Fin che vedrai finire	Until thou seest the end
Di Settembre lo mese	Of the September month.
Che l'altro a folli imprese."	At other times, 'twould be folly."

This rule, observed to a greater or lesser extent from the infancy of navigation, became the law and established usage on the sea, in the thirteenth century,[14] which none violated save the more greedy captains who were willing to take the risk of shipwreck for the sake of possible profit. Vegetius, a Roman author of the fourth century, informs us that in his day the seas were closed by law from the third day of the ides of November to the sixth day of the ides of March, in consequence of the horrors of winter navigation, which he described in gloomiest colors as follows: "Nam lux minima, noxque prolixa, nubium densitas, aeris obscuritas, ven-

[14] Maritime legislation originated in the 12th century and was continued in the "Loi de Trani," the "Code Navale des Rhodiens," the "Code de la Mer," which became the common law, and the "Lois d'Oleron,'—all of which were inscribed on parchment.

torum imbri, vel nivibus geminata saevitia, non solum classes a pelago sed etiam commeantes a terrestri itinere deturbat."[18] (For the dim light and long night, the density of the clouds, the obscurity of the atmosphere, the storms of wind, aggravated by the hardships of snow, deter not only fleets from going to sea, but even travelers from making journeys by land.)

Little as these grim horrors are heeded by navigators of modern times, they were well calculated to terrify those of the middle ages. Even in the middle of the sixteenth century (law of June 8, 1569,) the government of Venice, always most careful of her marine, forbade captains of commercial vessels sailing under her flag, from leaving Alexandria, Syria or Constantnople from November 15th to January 20th,—"tempo delli mesi del crudo inverno." Then, however, the time was not far distant when such restrictions upon navigation were removed everywhere, and commerce was left free to take chances of wind and weather at all seasons of the year.

Another significant fact of the navigation of Barberino's day is found in his prudent advice to pilots when overtaken by darkness and storm:

"Se vuò passar nascoso
Vela bianca pon gioso,
Ergi la nera oscura,
Ch'a nome lupo; e cura
D'aver questa minora
Cosi l'albore allore.
E non sempre conviene,
Quando giorno su veine,
Che tu le vele bassi
Tanto che squovra i passi
E manda su'l gabbiere,
Attorno per vedere

"If thou dost wish to be unseen,
Lower the white sail,
Hoist the black one
Called the 'Wolf,' taking care
That it be a small one
Like unto its mast.
And it is not always safe
At break of day
To lower thy sails
Until out of sight of land,
Then send the top-man aloft
To see if an enemy be in sight.

[18] Flavius Vegetius-Renatus, "Institutiones Militares," which great work, first printed at Utrecht about 1473, was translated into French by Bourdon in 1743. It was fortunately written at a time (the fourth century A. D.) when the record of the ancient marine was nearly lost. Vegetius is authority for the statement that the blue color of dress among mariners originated with the Veneti, a people of Vannes on the northwest coast of France, who painted their vessels and the sails and rigging thereof, a blue color. The Latin name of this color is the same as that of the people, viz., Venetus, which seems to indicate its origin. The Romans borrowed the custom from them, and Vegetius remarks that Pompey, after his victory over Caesar, on the sea, adopted the blue or marine color instead of the purple, and affected to be called the son of Neptune.

Se vedessi avenire
Che vento ti rompesse
Timoni e t'abbuttesse
L'abore grande tuo;
Metti nel luogo suo
L'abore tuo minore.
S'abbate quel; puo' tore
L'antenna, e lei rizare,
Fin che luce t'appare.
In luogo di timoni
Fa spere, e in aqua poni."

If it should happen
That the wind and sea
Should break thy rudders[16]
And thy mainmast destroy,
Then put in its place
Thy smaller mast.
If this too be carried away
Put in its place the lateen-yard,
Until dawn appears:
And instead of the rudders
Make a spar-drag, and put it in the water."

Generally, during night navigation, strict silence was enjoined upon the crew, and if there was a boatswain on board he was forbidden to use his whistle.[17] No bells were sounded lest the presence of the vessel might be made known to marauding cruisers in search of plunder. The black sail was called lupo (wolf) because it gave to navigation the appearance of that animal's stealthy movement. It was also used to indicate mourning, in which case the entire vessel was painted black. On the other hand, piratical vessels were usually painted sea-green that they might better escape the notice of their victims. There was an element of great danger to be guarded against in those days, oftentimes more destructive than the storms so vividly described by Barberino. With infinite detail, this master of the early language of the sea, points out what the mariner should do in such emergencies, suggesting expedients, such as jury masts and drags, that are in use even in our time, and reminding him always of the value of the magnetic needle (calamita), a guide by day and night, which could not lead him astray—

"Nochhier buono et usato
Ponnese accompagnato,
De quanti adottrinati
Di calamita stati.
E quella e ben perfetta
Che in fallo non getta."

"A good, experienced pilot
As well as his substitute,
Should be well informed
About the calamita (needle).
This is a perfect guide
That cannot lead astray."

[16] In those days many vessels had two rudders.

[17] Originally, the whistle "Fischietto," attached to a gold chain, was used by the commander-in-chief of a fleet to stimulate the men in action. In time, it descended to the boatswain, in whose hands it is still used with telling effect in the routine of ship's duties in the merchant marine.

It is sufficient for our limited purpose to give a mere passing glance at these early poetic authorities, whose memory it is well to revive in this connection. Interesting also is the testimony in prose, of that great statesman, jurist and philosopher of the thirteenth century, Brunetto-Latini,[18] whose immortal pupil, Dante, unkindly consigned him to the depth of the "Inferno." While in exile in England in 1250, Brunetto was made acquainted with the polarity of the magnet by Roger Bacon, in his "Opus Majus," and "De Cosmographia," and thus wrote about it to a friend in Florence: "This discovery, which appears useful in so great a degree to all who travel by sea, must remain concealed until other times; because no master mariner dares to use it lest he should fall under a supposition of his being a magician; nor would even the sailors venture themselves out to sea under his command, if he took with him an instrument which carries so great an appearance of being constructed under the influence of some infernal spirit."[19] At a later period, while discoursing of astronomy in his "Tesoro," Brunetto thus describes the mariners' guides at sea: "Then follow in order, all times, days and nights, according as the firmament turns continually from east to west under its two eyes, which are two stars, one the South and the other the North star; and these never change except as the axle of a wheel. Thence it comes that mariners navigate by the sign of these stars, which are called pole stars by every people; and those of Europe and Africa navigate by the Northern star, and other people towards the South navigate by the Southern star. And to prove this truth, take a loadstone and you will find that it has two faces, the one lying towards the North and the other towards the South pole star, and therefore mariners would be laughed at if they did not take care of this.

[18] Brunetto-Latini was born in Florence, year unknown. He died in Italy in 1294. He was probably the most learned man of his day, and his great work "Il Tesoro," originally written in French, during his exile in France, but printed in Italian in 1474, was a veritable encyclopedia of all the knowledge of his time. He also wrote the "Tesoretto," a very different work, in verse, on moral precepts. Dante in his "Inferno" is said to have placed his master Brunetto there, for having written an obscene work entitled "Il Pataffio."

[19] Napier, in his "Florentine History," London, 1846, from which the above extract is taken, informs us that in the Vatican and Barberini libraries at Rome, there are manuscript poems of Farinata, Amorozzo, Guinicelli, Brunetto-Latini and many other poets of the thirteenth century, anterior to Dante.

And know, that by these two stars we can understand the point of the needle and towards which pole it lies."

Such was the implicit faith of men of learning, poets and philosophers of the twelfth and thirteenth centuries, in the first rude floating compass used by the French and Italian mariners. Azuni wrote the "Dissertation sur l'origine de la Boussole," Paris, 1805, in which he sought to prove that the French were the first to make use of the compass, under the name of "Marinière," in the time of the crusades. Azuni was an authority upon the subject of mercantile and maritime law, piracy, naval armaments, privateering, &c. In his work on navigation, he states that Père Ziménès, a celebrated Italian astronomer, proved the priority of the French as discoverers of the compass[20] in his work, entitled "Del vecchio e nuovo Gnomone Fiorentino" (1752). They did not know that a similar instrument had long been employed by Arabian navigators in the Eastern seas, who probably were the first to use a compass pointing to the North; or that the Chinese[21] for hundreds of years, had been navigating the Indian ocean under the guidance of the needle (not floating in water) and pointing to the south. Indeed, it is stated in a recent work[22] that "the oldest recorded instance of the use of the mariner's compass is found in the Chinese historian's account of the voyage of the Imperial Ambassador to Corea from Nanking, by way of Ningpo in a fleet of eight vessels, in the year 1122." And the same author states that the "Chinese learned to biterly regret the day when the magnetic needle, invented by themselves, got into the hands of those daring marauders, the Japanese, who, at the period of the discovery of America, were the terror of the Chinese coasts and rivers." But the defects of the floating compass did not lessen the faith of pilots and mariners in the priciple involved. The wonder is, says another writer, that it could have remained in its original crude state until the

[20] It is stated that Peter Peregrinus, in the 13th century, "made a pivoted compass, with the lubber's point, and the scale marked on the circle."

[21] Klaproth has clearly proved in his "Lettre à M. Humboldt sur la Boussole" Paris, 1834—that the Chinese understood the property of the magnetized needle in the first century of the Christian era, and that through the Arabs who traded with the Coreans and Chinese in the India seas, it was finally introduced into Europe, by the way of the Red sea, during the period of the crusades.

[22] "Corea, The Hermit Nation," by Wm. E. Griffis, New York, 1888.

opening of the fourteenth century, when Flavio Gioja, a pilot of Amalfi, in the kingdom of Naples, bethought him of suspending the needle upon a fixed pivot enclosed in a box, so as to preserve its horizontal position at sea. In regard to the origin of the fixed compass, Jal denies the claim of Gioja in these words: "The machine described by Gioja was in his time rude and imperfect, and it was employed only when the sea was calm, and the ship sailing easily; otherwise, the needle sustained on the surface of a basin of water by a straw, could not maintain its natural direction towards the pole. It was therefore only a budding invention. But the first great step was taken, and thence forward it was necessary only to find the means of suspending the needle on a solid pivot in a closed box. And this is all that was done by the Italians, who assert that because the "boussole" got its name from their language (bossola-box) that it is therefore their invention."[23] Gioja being a subject of the King of Naples, of the junior branch of the Bourbon family, he is said to have marked the north point of the compass with a fleur-de-lys, in compliment to his sovereign. But Davies, in his "Early History of the Mariner's Compass," states that the figure "is probably either an ornamental cross, a symbol much used in that day, or, as the compass came into use from Arabia, the figure might be a modification of the *Mouasala*, or dart, by which name the Arabs called the magnetic needle." However this may be, all the nations adopted this figure, and some writers affirm that Gioja died without ever fully understanding the true value of his invention. Indeed it was not generally used or trusted until the early part of the fifteenth century, when the bold mariners of Portugal—one of the smallest of the kingdoms of Europe—abandoning the old rules and practices of navigation, ventured out, under the guidance of the compass, into the "Green Sea of Darkness," as it was called by the Arabs, in quest of new worlds.

The honor of inaugurating this grand movement belongs to Dom Henrique, better known as Prince Henry the Navigator,

[23] Bernardino Baldi, a fellow-student of Tasso, and a renowned mathematician and poet of the 16th century, commemorates in his book, entitled "La Navigation," the discovery of the compass, and describes the manner of building a ship and navigating her at sea,—also the sciences necessary to the seaman, and the dangers he must encounter. This poem is in the Congressional Library at Washington, and will repay perusal.

fourth son of John I. of Portugal, surnamed "the Great, and Father of his country," and of Philippa of Lancaster, daughter of John of Gaunt, the noblest woman of her time. Born in 1394, the young Prince Henry acquired a love for learning by inheritance and by contact with the erudite men attracted to his father's court.[24] In due time he became a soldier, well versed not only in the military art but also in geography and in the mathematics and astronomy of that day, which personages of his rank usually slighted. It was mainly to his efforts that was due the success of the expedition[25] of 1415 against the Moorish stronghold of Ceuta, in which he held a high command under the eye of King John, his father, who knighted him on the field of battle, and it probably was in the short sea voyages of that expedition to and from Ceuta, that he first became acquainted with the sea and seamen. Moreover, the prevalence of English habits and ideas at the Portuguese Court of that day, together with his English blood on his mother's side[26] may have given him a taste for navigation; but what most influenced him in that direction were the wondrous tales of the riches of Guinea and other countries in Africa, told him by Moorish prisoners of high rank captured at Ceuta. Moreover, there was placed in his possession a copy of the priceless manuscript of Marco Polo's travels, with the map thereof, which, with his own careful study of the globe, then so small as to its known limits, and of the traditions and stories of medical discoveries still current in his day, filled his philosophic mind with the possibility of extending the power and dominions of Portugal along the west coast of Africa, and finding perhaps a sea route to the far distant countries of India. On his return to Lisbon, therefore, he determined to devote his life and revenues to maritime explorations.

[24] The "Life of Prince Henry the Navigator," and the "Discoveries of Prince Henry the Navigator," by Richard Henry Major, and published at London in 1868 and 1877 respectively, abound with material in text, illustrations and portraits, most interesting to nautical men of all nations. The miniature likeness of the Prince, in the later volume, is copied from Azurara's original manuscript chronicle.

[25] Of 212 vessels of all sorts employed in that expedition, 27 were English craft which turned from their course to Palestine to join the Portuguese attack upon the common enemy.

[26] His mother, Queen Philippa, was the sister of Henry IV of England. They were the children of "Old John of Gaunt"—a patron of literature—whose daughters were the first English ladies who knew how to write.

The conception was worthy of a great mind, but it could not have been put in execution at Lisbon where court influences had obstructed his first preliminary efforts in that direction.[17] The grandees of Spain opposed his scheme, but the young officers of his household encouraged him. So he abandoned the gay capital and fixed his residence, in December, 1418, on the isolated rocky headland of Sagres, in Algarve, afterwards known as Cape Sagres, and later as Cape St. Vincent, which was the "Sacrum Promontorium" held in veneration by the ancients as the abode of the gods of the Iberians. His quick eye, in sailing to and from Ceuta, had fixed upon this commanding situation as a most fitting spot for the development of his plans, and there, says Faria y Sousa, (in his "Asia Portug. Vol. 1, Chap. 1.") "the view of the unexplored ocean inspired his hopes and endeavors, and enabled him to indulge that genius for mathematics and navigation which he had hitherto been obliged to neglect." He erected suitable buildings, including an observatory, and a hydrographic school, which were the beginning of the settlement of Sagres, afterwards called Villa do Infante, when it was protected by strong walls. At his invitation, there came to Sagres adventurous young officers of his military household, who had served under him at Ceuta, Lançarote, Pires, Tristram Vaz, Zarco, Diaz, de Castro and others, together with learned professors, Arabian astronomers, Jewish mathematicians, and mariners of different nationalities—all desirous of participating in his projects of discovery. He also provided facilities for shipbuilding in the neighboring port of Lagos. Thus was formed around Prince Henry a practical training school for his countrymen, inclined to maritime adventure, as well as for foreigners admitted into his service. Indeed "it is not until Prince Henry's time, says Major, that we find the names of individual cultivators of the sciences of astronomy and mathematics organized for this express purpose." It was necessary to bring these men together at Cape Sagres to discuss the projects of Prince Henry, and fit themselves for the arduous work of maritime exploration.

Perhaps the most useful man in that little nautical community was Mestre Jacome, a native of the Island of Majorca, and famous for his skill in the arts of navigation and map-making. He was

[17] In 1412, before the reduction of Ceuta, Prince Henry had sent a caravel to explore the coast of Africa, which was the first voyage of discovery undertaken by the Portuguese.

employed at the school in this special capacity, and was director of the studies of the Portuguese officers and others assembled there. Cartography, then in its infancy, was a favorite study of the Prince himself, and of his elder brother Dom Pedro, who fully understood its importance in connection with the necessities of maritime commerce, and procured from the pilots of Genoa and Venice, and from every other available source, all the knowledge then current of land and water routes. His clear mind enabled him to profit by such geographical speculations as were contained in the works of Greek and Roman writers down to the time of Ptolemy—the last of the prominent geographers of antiquity—doubtless, he had consulted the geographical works of Cosmos,[28] merchant, explorer and monk, of the sixth century, and had seen the famous silver globe on which the Arabian geographer Edrisi, from materials collected from travelers to various parts of the known globe, engraved a map of the world, in the middle of the twelfth century, for Roger, king of Sicily.[29] In connection with this globe we are told by Judge Daly [30] that whenever Edrisi had occasion to refer to the fabulous statements of the Greek geographers, he added the significant words "God only knows how this is." It cannot be doubted that the Arabian scholars, in Prince Henry's household, acquainted him with the little that had been done for geographical science by their countryman during the long interval of twelve hundred years since Ptolemy's time. It was the learned men of Arabia who preserved, translated into their tongue, and annotated the great work of Ptolemy [31] the Greek text of

[28] The chief work of Cosmos was his "Topographie Chrétienne," recording the opinions of Christians concerning the world, in 12 books. He denied that the earth was spherical, basing his opinion upon reason, the scriptures and Christian writers who preceded him. This work is the only geographical relic of the least importance which has come down to us from that period.

[29] In a manuscript in the Bibliothèque Nationale at Paris, there are 69 maps supposed to have been copied from this globe (Daly).

[30] Charles P. Daly's address on Cartography, delivered before the Geographical Society of New York, in 1879, is a most complete record of facts in the history of Cartography down to the time of Mercator.

[31] The work of Claudius Ptolomaeus, written in the second century, contained twenty-six maps, and was a fruitful subject of study and controversy for many years after it was printed in Rome, in 1748. Although confessedly the most profound astronomer among the ancients, he was unable to calculate the latitude within one degree.

which, like other treasured manuscripts of ancient writers, was literally bound in chains, and was brought to Genoa by Greek emigrants, and entrusted to the care of the Dominican Fathers. The southern Arabians settled on the coast, were sea traders and expert pirates as well as pilots in the eastern seas; they studied geography more in its commercial and money-making bearings than as a science; and it is stated that in order to facilitate navigation, they calculated tables of latitude and longitude by the aid of astronomical observations, and made rude coast-charts, floating compasses and other nautical instruments. It appears, however, that there were no special maps or charts worthy of the name until the fourteenth century, when, says Judge Daly, "a beginning was made in the art of cartography by a few ingenious draughtsmen and students of geography of the Latin nations. Adventurous men like Marco Polo[32] had long before visited unexplored lands ranging from the Arctic regions to India, and from the Mediterranean to the Pacific ocean; bringing back with them notes, itineraries, and road maps of their travels which, although received with some incredulity at first, greatly aided the earliest cosmographers of Spain, Portugal and Italy, in their difficult work. Advancing a step further, there appeared, for the use of mariners and travelers, what were known as "Portulanos," which served as a basis for the construction and improvement of nautical maps in the following century. "The Portulano," says Daly, "was a small oblong book which had the two-fold qualities of an almanac and a coast-chart. On its cover was a representation of the points of the compass and a table of the days of the year, and upon the sheets inside was a careful delineation of the coasts, the positions of seaports, and statements of distances from one port to another, according to the direction of the compass, which was denoted by straight lines running in all directions; with which was comprised intelligence as to the depths of the harbors, and other nautical information of a practical character." The chief Portulanos of this period were the Sanuto (1306), Laurentian (1351), Pizzigani (1367), Catalan (1375), and others used in Mediterranean navigation, the maps being drawn on parallel meridians, and presenting

[32] This great pioneer of land travel also served as a fighting volunteer in a Venetian war galley in the terrible battle of Curzola (1298), won by the Genoese. His narratives, so long regarded as fictitious, are now considered by some good authorities, as trustworthy.

the results of actual observation, together with certain coast-lines of a speculative character. The latter were laid down chiefly on the West coast of Africa, between Cape Bojador and the southern extremity of the continent. A similar showing was made in the Mappamondo of the Venetian geographer, Andrea Biancho (1436), author of several hydrographic charts of parts of the world prior to the discoveries of Prince Henry's captains, each of which bore the inscription "Andrea Biancho de Venetis me fecit," removing all doubt as to their origin, but they remained unknown until the last century, when they were discovered in the great library of San Marco at Venice, by the Abbe Morelli.[33] Of far greater importance was the famous Mappamondo of his countryman, the geographer and monk, Fra Mauro, who in the Camaldolese Monastery of San Michele de Murano, near Venice, taught to zealous students the subject of cosmography with great success. This unsurpassed specimen of mediæval cartography, embodying the results of the Portuguese explorations in the Atlantic, which led the way to the voyage of Columbus, was painted on the wall of the monastery, probably by Fra Mauro himself, and with the assistance of Andrea Biancho, was completed in 1457. It was of very large size, and was frequently copied,[34] the best reproduction being that on parchment, illustrated by Cardinal Sulla, also a monk in the same monastery, which is still to be seen in the "Sala dello Scudo" of the ducal palace at Venice, whose walls are covered with chart pictures of different parts of the globe. But this Mappamondo had many serious defects and errors, with much guesswork, especially in the delineation of the African coast lines, as no discovery of African mainland is proven to have been made south of Cape Bojador before the time of Prince Henry, the Navigator. But the Portulanos and maps, copies of which were procured by the Prince, must nevertheless have been of much utility in his plans of exploration. Major shows, conclusively, that Prince

[33] Justin Winsor writes enthusiastically of "the surprising wealth of sea charts and world maps showing the growing cosmographical notions which preceded and followed the era of Columbus, possessed by the great libraries of Florence and Venice. The mere enumeration of them makes a good-sized octavo volume."

[34] Major states that a photographic copy of this map, of the size of the original, is exhibited in the British Museum. And Winsor speaks of a curious Old World map of about the same period, which hangs on a wall of a side aisle in the cathedral at Hereford.

Henry was not the originator of the hydrographic plane chart, the claim to which goes back to the second century before the Christian era. But the plane charts made under his direction by Jacome were of fresh ocean routes actually sailed over by his captains,[1] for which reason they were very properly called "Prince Henry's charts." And herein lay the merit of these Portuguese sea-charts, which no man can dispute. But we have to lament the fact that not a single specimen of Jacome's handiwork, as stated by Major, has come down to us; and the disappointment is not lessened by the reflection that, like the earlier maps and charts, they were based upon the old erroneous opinion as to the shape of the earth.[2] This, however, did not often prevent the pilots from finding the places they were in search of. Nor did it in the least affect Prince Henry's faith in the meager appliances of navigation then available. Indeed, we find him sternly rebuking Captain Gilianez who, after having reached the Canaries, put back on account of storms and stories told him of the terrors of Cape Bojador, which Leonardo Dati, in his poem entitled "Sphera Mundi" had fixed as the limit of Africa. "You come to me," said the Prince, "with the statements of four seamen who have been accustomed to the voyage to Flanders, or some well-known route, and beyond that have no knowledge of the needle or sailing chart. Go out then again and give no heed to their opinions, for, by the grace of God, you cannot fail to derive from your voyage both honour and profit." Smarting under this rebuke, Gilianez set sail again and brought back to Lagos proofs of having doubled the dreadful Cape—an exploit that required twelve years of repeated effort, and was then considered equal to any recorded in the history of maritime adventure. It was this incident, perhaps, that caused Prince Henry to take an oath that his caravels should sail in despite of all obstacles far beyond the known limits of navigation. In fact, however, at the end of half a century not more

[1] Captain Lod da Mosto, on the title page of his Portulano, published at Venice in 1490, puffed it in smart commercial style as follows: "Questa e una opera necessaria a tutti li naviganti chi vano in diverse parti del mondo."

[2] This subject of fierce controversy was ably discussed in the 13th century, in a work entitled "De Sphera Mundi," by John Holywood, an Englishman, whose name was Latinized by his many commentators into Sacrobosco."

than 1400 geographical miles of the African coast had been discovered."

We can well imagine the stir and bustle of preparation for these voyages that kept the little nautical community at Sagres, and the little town of Lagos, in a constant fever of excitement. The hurried building and launching of the vessels, which were stouter and better than any then afloat, the setting up of their masts and rigging, the bending of sails, the stowage of supplies—all done with great parade, after the manner of the old Portuguese—were watched with absorbing interest by the little nautical community; and when Captains Vaz and Zarco sailed out of the harbor of Lagos on the first voyage of exploration in 1418, with orders to double Cape Bojador and enter the tropical sea, they were followed by the blessings of the Church and the evvivas of their less fortunate comrades left ashore. This, however, was a rather timid venture along the coast, until a fortunate gale of wind blew the caravels out to sea as far as a small island which they significantly named Porto Santo. Overcome with joy at their unexpected good fortune, they returned at once to report to Prince Henry, who in the following year (1419) sent them out again together with the Italian knight, Bartolomeo de Perestrello, the future father-in-law of Columbus, to occcupy Porto Santo, of which he was appointed the governor. They afterwards discovered the Island of Madeira, and following them, at intervals, other captains—Gilianez, Diaz, Gonsalves, Nuno Tristram, Cervero, and Lanzarote, penetrated the "Sea of Darkness," south of Bojador to the eighth degree of north latitude, under the direction of Prince Henry, whose solemn oath to his captains was thus triumphantly kept in despite of difficulties and disappointments in number and gravity almost beyond credence."

[37] It was not until 1484, twenty-four years after the death of Prince Henry, that the Portuguese first crossed the line, in the reign of John II of Portugal.

[38] Markham, in his "Sea Fathers," relates an interesting event in connection with the doubling of Cape Bojador in 1434. On making a landing beyond the Cape so dreaded by mariners, two young Portuguese cadets, corresponding in rank to our midshipmen. (Hector Homen and Diego Lopez d'Almeida) sailing on board of Baldaya's varinel on this expedition, offered to go inland on horseback in search of the natives. Armed only with lances and swords, these adventurous youths found a party of twenty Moors whom they attacked and dispersed and returned triumphant to their caravel, one of the two being wounded in the foot. This is perhaps the earliest recorded nautical adventure of this class of officers.

The caravel or "Caravo," made famous by the early Portuguese navigators was, in build, a light bluff vessel of from sixty to ninety tons, with square poop, masts rigged and fitted like a sailing galley, fore-and-aft sails, and easily maneuvered in any wind. Many of them were quite fit to encounter the storms of the Atlantic Ocean; some were very good sailers, making as much as ten knots an hour, and we know that one of Columbus's smaller vessels, the Pinta, made the voyage from Palos to San Salvador in thirty-five days, which is as much as could be done by Spanish craft of similar size and rig in our day. Cadamosto, one of Prince Henry's captains, declared that the Portuguese caravel of his time was the best sailing vessel in existence.

It is stated that, at one time there were more than fifty captains and as many caravels and varinels (the latter propelled by oars) employed by the Prince, and that on a few occasions a dozen or more vessels sailed in company on voyages of discovery. The dependence of the pioneer captains and pilots was placed partly upon the newly introduced needle,* supplemented by crude observations of the heavens, not accurate enough to fix their positions, of the weather, of the color of the sea, and of the stars that had guided mariners from ancient times. Of the ocean currents and much dreaded drift, to which the short bluff vessels of that period, with a large spread of canvas were particularly exposed, they had everything yet to learn, and they had to find material for the sea-charts yet to be made. But these bold navigators took the chances of dire disaster and sailed on southwards, making discoveries of islands of Porto Santo, Maderia and Arguin, and afterwards of the mainland of Africa to a point south of the Gambia river, which jewels were added to the crown of Portugal, with ample reward to the successful explorers. It was then not known that the Madeiras had been previously discovered by an Englishman, and other islands off the African coast by Genoese captains sailing in Portuguese vessels. Prince Henry's captains were entitled to all the credit of adding those territories to the Portuguese domain.

As the fame of Prince Henry's doings at Sagres spread abroad, he was visited there by notables of Portugal, as well as by enterprising travelers and adventurers from other countries, and espe-

*Major affirms that an astrolabe of rough construction, for taking the altitude of a star, was used by Prince Henry's captains.

cially by captains of Genoese and Venetian vessels, seeking information of the latest discovery of land or copies of Jacome's sea-charts. Unlike the Arabs, who were always willing to give geographical information to strangers, the Portuguese were very secretive as to their discoveries and commercial enterprises. In fact, no foreigner could obtain such information from Prince Henry unless he consented to enter the service of Portugal. A number of Genoese and Venetian mariners, Pessagno, da Noli, Usodimare, Lago, Cassano, Perestrello and others, joined the Portuguese caravels, but to Italian navigators in general, then more advanced than all others in the knowledge of nautical affairs, and who might become rivals of the Portuguese in the new navigation, Prince Henry was probably not very communicative, unless they entered his service. The Prince obtained from Marco Zeno's ship, becalmed off the Cape, a valuable recruit in the person of a young Venetian, Cadamosto, whose narrative of his subsequent voyages to Ethiopia, in the service of the Prince—regarded as a model in style—was the earliest printed account of modern ocean navigation, although not considered very accurate.[*] He and his shipmates were doubtless amazed at the appearance of the savage looking natives whom they saw for the first time. But he in turn astonished them with the roar of artillery, then coming into general use, and bewildered them with the weird music of the bagpipes, which they believed to be a musical animal, until allowed to handle the strange instrument. Whether it was the shrill pibroch of Scotland or the softer instrument of the Italian pifferari, does not appear; but it is not improbable that the seductive piper may have been instrumental in leading some of the unsuspecting savages into captivity. We know that many hundreds of Africans were sold into slavery in the streets of Lagos by Prince Henry's captains; but he is acquitted by old chroniclers of any desire to establish a system of bondage.

This was indeed a new era of navigation, in which the great

[*] The title of this book is "La Prima Navigazione per l'Oceano alla terra de Negri della Bassa Ethiopia, di Luigi Cadamosto," Vicenza, 1507, in quarto. But the most valuable account of the voyages and conquests of Prince Henry's captains, down to 1448, is entitled "Chronica do descobrimento e conquista de Guine." It was printed at Paris, where it was accidentally found, in 1841, from the original parchment manuscript written by Azurara in 1448-53, under the direction of Prince Henry himself, from the rough notes of Affonso de Cerveira, one of his captains.

discoverer of America, after having spent his youth about the docks and shipyards of Genoa, commenced his nautical career as a ship captain the very year of Prince Henry's death (1460), and it is by no means an exaggeration to regard the gathering of navigators at Sagres, in the fifteenth century, as a "Nautical School." It certainly was the earliest assemblage of seamen under instruction ashore of which we have any knowledge, and the results were very remarkable. Pedro Nunez, the most learned mathematician of the sixteenth century, with a just feeling of pride in the exploits of his countrymen, informs us that the Portuguese navigators were very well taught, and provided with that living, divine instrument (vivum divinumque organum), unknown to the ancients, which they called the nautical needle, and with astronomical instruments and tables of the movements of the sun and moon, which enabled them to keep the sea for months out of sight of land—a thing previously unheard of. Not less proud of their exploits was that honest old English Admiral, Sir William Monson, whose quaintly expressed testimony took down the conceit of the first possessors of the compass, "It was the Portuguese who, by their travels and mathematical art and learning, hath made apparent to the Chinese the existence of other worlds than their own." Some of this laudation, referring more particularly to the period following the opening of the Cape sea-route to India, may be applied in a limited sense, to the work of Prince Henry's school, which produced so many skilful navigators. Later writers do not hesitate to give it more high sounding titles. Irving, in his "Life of Columbus," dignifies it with the title of "Naval College;" De Sein, in his "Histoire de la Marine," calls it a "Nautical Academy;" in the programme of studies of the French Naval School at Brest, it is specially mentioned among the nautical subjects as the "First School of Navigation and Foundation of the Portuguese Marine;" it is called "Prince Henry's School of Navigation and Astronomy," by his biographer, Major; and, finally, the inscription on the monument erected to his memory at Sagres, in July, 1840,[a] describes Prince Henry as the "Founder of the famous school of Cosmography, the Astronomical Observatory, and the Naval Arsenal, preserving, improving and enlarging the same till the close of his life." This triple designation indicates the varied

[a] This was a very tardy recognition of the merits of Prince Henry by his countrymen,—380 years after his death in 1460.

employments of his large nautical household at Sagres, to which place he originally gave the name of Tercena Nabal, or Naval Arsenal. But by whatever name it may be called, Prince Henry's school was the first attempt at nautical education in Europe, although designed specially to facilitate the work of oceanic exploration. As might be expected, great progress was made, not only in the methods of this work, but also in the arts of seamanship and shipbuilding, during Prince Henry's residence of forty-two years at Sagres. There could be no better evidence of the wisdom of this remarkable man, who is described as "large of frame and brawny, stout of heart and keen of intellect, and extraordinarily ambitious of achieving great deeds." He was both soldier and sailor, as well as student and teacher of the sciences of his time and by his exertions in the cause of university education at Lisbon, won the grand title of "Protector of the Studies of Portugal." The desire of his life, as well as his capacity, was fitly expressed in the motto "Talent de bien faire," (the desire to do well) which he won the right of affixing to his escutcheon. Good reasons had Portugal to deplore the loss of her most enlightened Prince, who died at Sagres November 13, 1460, in the seventy-sixth year of his age and the forty-second year of his residence there.[42]

Although this event occurred thirty-seven years before the goal of his ambition was reached by one of his countrymen, Vasco da Gama, it cannot be doubted that the numerous discoveries of Prince Henry's captains on and off the west coast of Africa, led directly to the finding of the sea-route to India by the Cape of Good Hope, and to the monopoly of that route by his countrymen. Naturally, even their limited success created in the Portuguese nation a lust of sea dominion which it appears the lapse of centuries has not entirely eradicated,[43] and in the Portuguese captains, a haughty demeanor which elicited from an irate French seaman, of a later day, this declaration, "I think it is their belief that God

[42] Prince Henry was buried in the Royal Monastery of Santa Maria de Batalha, built by his father, King John I. Upon the magnificent tomb erected there to his memory, says Major, "may be seen his culptured effigy, rich with the blazonry of the Middle Ages, and with orders, among which is conspicuous the Garter bestowed on him by Henry VI of England."

[43] The government of Portugal, some years ago, put forward a claim to the mouth of the Congo River, and the territory on both sides of it, which she still holds, based upon the discovery of that river in 1483 by Diego Cam, a knight of the household of King John II of Portugal.

made the sea and land for them alone, and that other nations are not worthy to navigate." Their best nautical poet gives expression to the same feeling at the close of his recital of Prince Henry's great deeds:

> "This Prince, inspired by heaven, claimes the Main,
> As her explorer."

We commend to the notice of young seamen the romantic story of Vasco da Gama's voyage to India, in a vessel of 160 tons, in 1497-99, told in the "Lusiadas" by his kinsman, Camoëns,[*] the "Pilgrim Poet of the Sea and Land." There they will find much to interest them in relation to the early methods of the nautical art, and in the customs of sailors, unchanged for centuries. In getting under weigh, Da Gama's sturdy mariners sang songs and catches to lighten their work, and made much noise, as is still the custom in the mercantile marine of Portugal and Spain.

> "Weighed are the biting anchors, rising slow,
> While 'customed capstan-songs and shouts resound."

It was in the Mozambique Channel, after having safely doubled the newly-named Cape of Good Hope that Da Gama came in sight of a strange flotilla manned by Arabs, who then sailed the Eastern seas with an air of sovereignty, as its masters. But the appearance of these Moorish seamen was not impressive, if the poet is to be believed:

> "They come costumed all in cotton gear,
> Of hues contrasting, striped, chequed, and white;
> One zone-girt cloth around the waist they wear,
> Other they throw on back in any plight;
> Above the waist-band each brown form is bare,
> Scull-cap on head; and as they wend their way,
> Shriek shrilly shawms,[†] and harsh-voiced trumpets bray."

Da Gama, however, having seen stranger sights during his adventurous cruise than half-naked boisterous Arab sailors, was not in the least disconcerted by such a reception. It was the attitude assumed by these haughty sea-kings towards him and his expedi-

[*] The "Lusiadas" of Luiz de Camoëns, translated by Richard F. Burton, London, 1880. The original work was published at Lisbon, in 1572, and was followed by thirty-eight successive editions in Portuguese, prior to the year 1700.

[†] Reed pipes.

tion that solely concerned him, and when they fiercely demanded whence he came and for what purpose, he diplomatically replied:

> "We are the occidental Portuguese,
> And, seeking orient lands, we sail the seas."

The pacific words disarmed the suspicions of the Arabs, who were ignorant of the existence of the new discoveries, so their pilots at once boarded Da Gama's vessels, and astonished him and his officers by their familiarity with sea-charts, the astrolabe, and the magnetic needle, all of which appliances used by them were of native construction and much superior to those used by the Portuguese pilots.[*] In fact, Da Gama could not have reached Calicut without the aid of the Moorish pilots whom the friendly King of Melinda sent on board his vessels. Their knowledge of the Indian seas and coasts was invaluable. But Da Gama had ample revenge in firing his "horrid sounding bombards" which literally stunned the Moors, and later, at Melinda, in Zanguebar, he outshone even the Moorish King of that country in a dazzling costume of rare handiwork.

> "The Gama cometh dight in dress Hispanian;
> But of French work the doublet was he wore.
> Satin which Adrian Venice works and stains,
> Crimson, a color which such prize obtains.
> Buttons of gold his looped sleeves confine
> When solar glancings dazzle gazing eyes:
> Hosen of soldier fashion purfled shine
> With the rich metal Fortune oft denies:
> Gold-hilted sword in mode of Italy;
> Plume in his bonnet worn a little wry."

Never had any follower of the seas been so gorgeously arrayed as Da Gama when he appeared before the King to relate the many mysteries of the air and sky that he had witnessed on the long and eventful voyage from Lisbon. This courtier's attire, however, was donned for effect upon the royal Moor, who treated his visitor with much stately courtesy. On the deck of his caravel, Da

[*] Markham tells us that they used Behaim's astrolabe and the Tables of Regio-Montanus to observe and calculate the latitudes. They employed "graduated circles of brass fitted with sights, the use of which required much practice, and they also had a wooden circle about 18 inches in diameter, rigged on three poles like shears, which was easy to observe with on shore, but almost impossible when the ship was rolling."

Gaba was, in garb and manner, the sea-captain, according to the type of his day, and less concerned about the cut of his doublet than about the maneuvering of his ship, and the making of a good land-fall. In this connection, the poet's interesting verses describe his use of Behaim's new astrolabe on approaching Angra de Sancta Helena, and the subsequent correction of uncertain observations made on his sea-tossed vessels:*

"In misty manner 'gan their shapes to show
The highland-range attracting all our eyes;
The pond'rous anchors stood we prompt to throw,
And furl the canvas which now useless lies:
And that with surer knowledge mote we know
The parts so distant which before us rise,
With astrolábos, novel instrument,
Which safe and subtle judgment did invent.

We landed, lost no time, on long and wide
Bight, and the seamen scattered 'bout the shore,
To see what curious things be there descried,
Where none descried or ever trod before:
But with my pilots, I retired aside
On farther sands, our land-fall to explore;
And lief the solar altitude would spare,
And map the painted world in chart and plan."

Here we find brought into due prominence the work of the pilots, upon whom the safety of ships and the success of voyages so much depended. The master or pilot in charge of a ship was expected to be well versed in the art of navigation, which then consisted "in the management of the sails, rudder, and other appliances and instruments then in use, in the knowledge of the winds, and celestial bodies; in the knowledge of harbors, rocks and quicksands, and the various perils of the sea." Some of them were noted for varied capacity, like La Cosa, who sailed with Columbus in several of his voyages as seaman, pilot, master and cartographer. It was he who performed the difficult feat of drawing an illuminated map upon an ox-hide five feet three inches in length, by three feet two inches in width, which was the wonder

*Neither De Gama nor Columbus could take accurate observations of the sun's altitude on board their vessels in a seaway with so awkward an instrument as the astrolabe, and each was obliged to take the instruments ashore to find the latitude.

of his day.[a] In fact, throughout the middle ages and down to the end of the sixteenth century, the pilot was in all nautical matters the most learned and important man of the ship's company, although "Providence was often the best Pilot at sea." While the pilot was on deck all was well,

> "But if the pilot slumber at the helm
> The very wind that wafts us towards the port
> May dash us on the shelves—the steersman's part
> Is vigilance, blow it rough or smooth." (*Walter Scott*).

Nor did he keep watch in a snug sheltered pilot-house like that of our day, which often invites languor and neglect. His station was at the helm, at the stern of the vessel, exposed to the fury of every gale, and he never left it till all danger was passed. He was looked up to by the crew with the reverence due to the sole possessor of the secrets of navigation, which were for some centuries most jealously guarded from prying eyes. Jal is of the opinion that the Italian word "Piloto," from which the English word is derived, is a corruption of Pedotto, which, in Barberino's verses, signifies Pilot; and that the word Pedotto comes naturally from the Latin Perdoctus (Perdotto in Italian), which means *very learned*. But in the days of Prince Henry's imperfect charts, the learned pilot was often in great difficulty,[b] making bad land-falls or running the risk of shipwreck. And there were no better charts until Mercator introduced his method of map-making in 1569. But this did not detract from the merit of Jacome and other Majorcans, whose maps and charts commanded the highest prices. Next to them in skill were the Catalans, one of whom, Gabriel de Valseca, is said to have received five hundred and fifty dollars of

[a] Juan de la Cosa, in his five voyages to the American continent, acquired so much knowledge of its geography—surpassing even that of Columbus himself—that his great chart of 1500 became of inestimable value. Even as late as 1868 it was used by our Secretary of State Seward to settle an important historical and political question touching the jurisdiction over the guano island of Alta Vela, adjacent to San Domingo. This oldest map of the New World, it appears, was discovered by Humboldt in Baron Walckenaer's library in Paris.

[b] In a collection of manuscript accounts of the discoveries of the Portuguese, in Africa and India, compiled in 1507 at Lisbon, by a German bearing the Portuguese name of Fernandez, there is a paper on "Ship's Routes, or Instructions to Pilots," showing that they were not even at that early period, left to their own unaided judgment.

our money for his map of 1439—a fair indication of its value in the eyes of his contemporaries. Indeed the Majorcans and Catalans were held in as high esteem as the Portuguese themselves for their better knowldge of all that appertained to the seaman's art, and for their confident use of the compass, which other mariners still hesitated to employ.

It is difficult for us to estimate properly the daring and importance of the early navigators who led expeditions into unknown seas, in the fifteenth and sixteenth centuries. Theirs was a task requiring great courage and grand faith, of which, in the absence of scientific information, they were possessed in an eminent degree. We very justly extol the daring of modern arctic explorers, who with the lights of science, the stoutest ships, and the aid of all the arts, have ventured, in our day, into the icy regions of the north in search of the pole, or of lost explorers in that benighted region, but their exploits bear no comparison with the expeditions of Columbus, Da Gama and Del Cano, in search of new worlds, in an age of comparative darkness and ignorance. It was then the highest honor to be a successful navigator, or to win the title of "Captain y Piloto Major"; which was eagerly contended for by ambitious seamen. Among the most prominent of those drawn to Lisbon by the fame of the discoveries of Prince Henry's captains were Cabral, Da Gama, Vasquez, Vespucci, Bartolomeo Colombo, and the most noted of all, his brother Cristoforo Colombo, whose services King John II of Portugal had not the wisdom to secure. What immortal honor to the little kingdom of Portugal if she could have claimed the exploits of both Prince Henry and Columbus! It seems incredible that of the first fifty-six years of the life of Columbus we know but little that is authenticated. It appears most probable that he was born in or near Genoa, three months after the arrival there of his Spanish parents, Cristobal and Maria Colon, exiled from Estremadura in Castille, and that according to the custom of the time he Latinized his name into Columbus, (Colombo in Italian) resuming his Spanish name, Cristobal Colon, when in the service of Spain. Prinzivalli states that the parents of Columbus were natives of Terrarossa in the Valley of Fontanabona, whence they went to Quinto and afterwards to Genoa. He gives his wife's name as Susanna Fontanarossa. The first and only biography of him in existence for three hundred years was that written by his son Fernando, fifty years

after his father's death, who commenced his narrative only at the period of the first voyage of Columbus in 1492, leaving to the regret of all mankind fifty-six years of that eventful life unrecorded. A clever French writer, in the *Figaro*, H. Lyonnet, a few years ago, endeavored to clear up some obscure points in this period of Columbus's life, and explained Fernando's strange reticence by the suggestion that he wished to conceal his own illegitimate birth at Cordova (1488), the result of an amour with a poor but titled lady of the Portuguese Court, Donna Beatriz Enriquez.[50] And then Lyonnet very appropriately adds that "the life of Columbus is yet to be written," and this in despite of the fact stated by the learned Spofford, former librarian of the Congressional Library, that since the date of publication of Fernando's biography of his father, and after an interval of 300 years, not less than twenty-five lives of Columbus in English, six in Spanish, fourteen in Italian, nine in French and six in German, have been published, the earliest and best of them all being that of Washington Irving, published in 1828. The English and American biographies, says Spofford, "are mere echoes or abridgements, in other forms of language, of the great work of Washington Irving, which was based upon documents, manuscript and printed, not previously used by biographers." It was confidently expected that the large collection of old manuscripts in the archives of Seville, recently classified, would throw light upon some vexed points in the early career of Columbus, but neither these nor the manuscripts loaned to the Centennial Committee of 1892, by the living descendant of Columbus, the Duke of Veragua, by the Vatican, and by the owners of the Berwick and Alba papers, contain the desired information. The Duke of Veragua, however, is positive on two points, that "none of the historians or writers[51] have been successful in

[50] In a recent Italian biography of Columbus by Virginio Prinzivalli (member of the Società Geografica Italiana) published at Rome in 1892, the actual marriage of Columbus with this noble lady at Cordova, in 1486, and the legitimate birth of his son Fernando, are stated with such certitude that doubt upon the subject is no longer possible. Prinzivalli also states that the best portrait of Columbus is that by Antonio Rincon, in the possession of Signor Fedele Colombo di Cuccaro.

[51] One of these, Casanova, in a recent work entitled "The truth as to the origin and country of Christopher Columbus," makes it appear to his own satisfaction, by discovered manuscripts and armorial bearings cut on a stone of an old house at Calvi, that Columbus was born and buried in that ancient Corsican town.

their efforts to deprive Genoa of being the birthplace of Columbus, and Havana the glory of possessing his ashes until their recent removal to Spain.

But in despite of all this doubt and uncertainty we have reason to believe that Columbus went to sea in his boyhood, studied cosmography and astrology at the University of Pavia, consulted journals and charts of his father-in-law Perestrello and other navigators of Prince Henry's school, read certain books such as the Liber Cosmographicus of Albert le Grand, and the "Imago Mundi" by Cardinal Pierra d'Ailly, Bishop of Cambray (an annotated copy of the latter by the hand of Columbus himself is still treasured in the library of Seville), and make himself familiar with everything bearing upon the great project he had in mind. In fact, he spent fourteen years in Lisbon (1470-1484), then the center of nautical and geographical enterprises, patiently awaiting recognition and gathering information on shore and in occasional short voyages to sea "to fix his notions on the subject of exploration," and if it be true that his poverty at that time obliged him to teach the seaman's art, and copy books and charts for a living, most fortunate were they who had such a master to instruct them.[28] Moreover, we have his own testimony in one of his letter, preserved to this day, in which he says, "Living the life of a mariner, from my youth, I desired to know all the secrets of this world, and for over forty years I had sought every sea thus far navigated, and conversed with learned men, ecclesiastics and laymen, Greeks and Latins, Indians or Moors, and people of many other sects . . . . I took pains to see all the books extant on cosmography, history, philosophy, and became familiar with astronomy and the navigator's art." That so close a student must have written much, is hardly to be doubted, but only a very small part of his writings, of any sort, have come down to us, and of his geo-

[28] At this time Bartolomeo, elder brother of Christopher Columbus, resided in Lisbon, and was at the head of a school of cartography which doubtless the latter attended. Afterwards, Bartolomeo accompanied Diaz to the Cape of Good Hope, and later went to England to pursue his business of map making, and to present a scheme of maritime exploration to King Henry VII, with a map of the world of his own projecting, but he was captured by pirates on the way, and on his arrival in England he found that his brother had entered into the service of Spain. It is mentioned as a singular fact that both brothers, after the manner of seafaring men, wore no beard.

graphical charts and notes not one. As to the statement often repeated that he derived his scheme for the discovery of America from a letter written to him in 1474, by his friend Toscanelli, the Florentine astronomer, we have now in the year 1900 convincing evidence that no such letter was ever written by Toscanelli.[a] Columbus may have heard some misty traditions of earlier voyages to the American continent, one of which at least is now known to have taken place, but there is no proof adduced on this point. The gallant old Admiral Monson, of the British navy (1588-1635) scouted the idea that Columbus had from any source a hint of the existence of a western continent. On the other hand, the veteran statesman, Bismarck, a landsman, speaking of the recent overdoing of Columbus worship in the United States, said in his blunt positive way to an interviewer in 1893, "The Norwegians were the first discoverers and settlers of America. Columbus was a map and chart maker, and before setting out on his first voyage had positive proof of the existence of other continents. And it would have been far better for America and her early history, had the settlement continued to be by Norwegians and other hardy tribes from the North." To our mind, Roselly de Lorgues, in his "Histoire de Navigation de Christophe Colomb," Paris, 1856, presents the most reasonable view of the great Genoese in these words, "It was not any mathematical knowledge he may have possessed, which must have been very limited, nor any superior knowledge of compass or astrolabe, or of the methods of observations of stars, tides, &c., which many other mariners of his day were conversant with, that gave him assurance of success. Indeed the science of that day, halting and uncertain, was calculated to lead him astray. It was rather a sort of inspiration

[a] Henry Vignaud, vice-president of the Americanist Congress, and secretary of the United States Embassy at Paris, read a paper in October, 1900, which convinced the learned men of the Congress that the statement of the biographers of Columbus in regard to Toscanelli could no longer be maintained. In April, 1898, Florence rejoiced in a ten days' festival in honor of her two famous sons, Paolo Toscanelli del Pozzo and Amerigo Vespucci, the former of whom was declared to be the veritable inspirer of the discovery of America, by virtue of the detailed instructions he gave to Columbus, and the latter—rival of Columbus—to be entitled by reason of his voyages to give his name to the new world. This festival at Florence was intended to eclipse that held in Genoa six years previously in honor of her immortal son, Columbus.

coupled with profound observation of the phenomena of the sea, air and heavens, a strong power of reasoning and grouping together facts and incidents, and deducing therefrom some of the general laws governing the world, and his faculty of reading between the lines and discovering what escaped the observation of others, that led him into the way of new cosmographic truths and discoveries."[a] Whatever may have been written to the contrary, we pin our faith to Columbus as the effective discoverer of the western continent, and we add our humble protest to that of many others against the very harsh though learned work of Justin Winsor[b] calmly robbing Columbus of nearly all the merit claimed for him by other biographers.

After long and patient waiting for years, the fulfillment of his hopes came to Columbus, not in Portugal but in Spain, and it was neither prince nor scientist nor navigator but two brothers, humble monks of the Franciscan monastery of Rabida, shut out from contact with the world by their vows and choice, who were instrumental in bringing about his result. It was Fra Juan Perez de Marchena who welcomed the poverty-stricken Columbus and his young son Diego to the hospitality of the monastery, obtained for him the favor of Queen Isabella of Castille, and made him known to the Pinzon brothers of Palos, who were to aid him with their practical knowledge as mariners, their caravels, and their money, in carrying out the great project of his life. And it was Juan's brother, Fra Antonio de Marcheno, cosmographer, geographer and astronomer, whose scientific knowledge gave to Columbus, at that critical moment, a fuller conviction of the certainty of his own views. How different from them was the haughty Padre Talavera, confessor of the Queen and learned in theology, who, in the famous Congress of Salamanca, described Columbus as one of those visionary Genoese who then roamed over Europe, selling chimeras, (vendendo chimere.) He must have known that Genoese captains had for two hundred years commanded many of the fleets and caravels of proud Castille.

When finally Columbus, an Italian and a stranger to his Spanish

[a] Roselly de Lorgues enumerates seven important discoveries of a scientific nature, besides that of the new world, made by Columbus during his several voyages.

[b] "Christopher Columbus, and how he received and imparted the spirit of discovery." By Prof. Justin Winsor, 1892.

crews, sailed from Capo di Palos, with a fair wind, on Friday, August 3, 1492, on board the small decked vessel *Santa Maria*, accompanied by two smaller undecked caravels, the *Pinta* and *Nina*, under command of the Pinzon brothers, he was prepared, says Admiral de la Gravière, to give the world the greatest example of courageous tenacity and faith that it has ever witnessed. In those days "Palos was the most flourishing part of Andalusia, and not only Columbus and the Pinzons, but nearly all the seamen whose names are famous in American discovery, dwelt in this poor little village, and sailed from this silent and useful wharf."[36] Yet it is asserted that when the official announcement was made that the litle harbor of Palos was selected for the preparation of Columbus' expedition, many vessels anchored there sailed away in haste, and seafaring men of the town hid themselves to escape service in the three little vessels that were to navigate the much-dreaded "mare tenebrose." Finally the two caravels of the Pinzon brothers were manned by natives of Palos. This adverse circumstance at the outset of his first voyage did not shake in the least the great faith of the future Lord High Admiral Colombo,[37] then in the fifty-sixth year of his age, mature enough and wise enough to take the chances of success or failure. Equipped with all the nautical lore of the day, and clearly convinced of the sphericity of the earth, which in fact was the basis of his whole project, he felt sure of reaching some undiscovered land to the westward. As to the imperfect charts of that day, which were described as "giving to a navigator the appearance of a man who knows where he is going, and who expects to find what he is in search of," they were of little use to him. With the skill and knowledge of a past-master in the art, he made his own hydrographic charts and notes of his four expeditions, all of which, it is to be forever lamented, have been lost, and a still greater loss is the historical record of those expeditions, written by Columbus himself for the information of Pope Alexander VI. A few maps of this period have come

[36] Payne's "History of the New World," 1892.

[37] In a letter addressed to the noble lords of the office of St. George at Geneva in 1502, Columbus appended to his signature the following official titles "El Almirante Mayor del Mar Oxeano y Visorey y gobernardor general de las yslas y tierra firma de Asia, e Indias del Rey y de la Reyna mys Senores y Capitan General de la mar y del su consejo." The great navigator had his vanities and dearly loved a title, after the manner of his countrymen.

down to us, containing the discoveries of Columbus, which possess great interest, such as the famous one of his pilot Jean de la Cosa, drawn on an ox-hide in 1500, that of Rausch in the edition of Ptolemy, printed at Rome in 1508, and the well-known map of Diego Ribera, begun probably in 1494, and finished in 1529, to enable Charles V to settle some territorial controversies with the Portuguese. Across this famous map was traced by Pope Alexander VI, the line of demarcation between the Spanish and Portuguese possessions. Ribero's "Universal Map" so-called, published in 1529, was also divided into two parts, each adorned with a richly illuminated coat-of-arms and flag, with drawings of animals supposed to be native to the different continents and islands represented, and with sketches of numerous vessels sailing in all directions. In one corner was a drawing of a quadrant with instructions how to use it, and in another a drawing of an astrolabe. The original of this map is in the Museum of the Propaganda at Rome.*

It mattered not that Columbus believed that the western land he had discovered was a part of the India he was in search of, or, as Lowell quaintly says that "while seeking the back door of Asia, he found himself knocking at the front door of America;" it was in fact a new continent that he had reached, which should have been named Columbia, more especially as the great navigator "had not the vanity to give his name to any land, island, cape or ship, after the manner of other explorers." It must be remembered too that his son, Fernando, in his "Life of Columbus," states positively that his father gave the name of "Indies" to the newly discovered land, to please the court. In any event, it appears that the naming

*In regard to these and other subjects comprised in the term "Americana," to the middle of the 16th century, the most ample information will be found in the remarkable work of Henry Harrisse, entitled "The Discovery of America," and published in 1892, which gives an account of 250 ancient maps and globes, existing or lost, with much valuable data concerning the early cartography of the New World, and biographical notices of 200 Portuguese and Spanish pilot-majors, pilots, cosmographers and cartographers engaged in the discovery or description of America. A Frenchman, of a calculating turn of mind, estimated that the discovery of America by Columbus cost only about 36,000 francs or 1,140,000 Spanish maravedis of that day. Columbus's pay was at the rate of 1600 francs per annum, and that of each of his two captains 960 francs,—the crews of 125 men receiving from 12 to 25 francs per month besides their mess expenses.

of the new continent was due to Vespucci,[89] the Florentine, commercial agent of the Medici family in Spain, where he made the acquaintance of Columbus. In his capacity of pilot and geographer, Vespucci took part in the Spanish expedition to Brazil, claiming the discovery of the continent one year before Columbus reached it, and he is said to have changed his Christian name, Alberticus, to Amerigo, the better to carry out his plan of having the new continent named after him. This was an easy matter for him as Piloto Major in charge of the making of new maps; if he did not use the name America himself, to permit others to use it, and thus obtain for himself indirectly what he did not dare to assert in plain words. Thus it came to pass that Vespucci enjoyed to the day of his death the credit of prior discovery of the great continent which must forever and unjustly bear his name. Perhaps it was some consolation to Columbus to know that the streets of Florence, the birthplace of his rival, resounded in 1493 with the verses of Giuliano Dati, announcing to the astonished people the results of his first voyage "to the new heavens and new earth, which had been hidden hitherto." As this effusion, written in old Italian by one of the most popular poets of his day, is almost unknown, at least in this country, it may not be inopportune to quote three selected stanzas of it, showing the author's sense of the gravity of his subject, his declaration of the fact of discovery by Columbus, and the appeal of the latter to the King of Spain.[90]

[89] Mr T. H. Lambert has elaborated a theory that this continent was not named after Amerigo Vespucci, but from "America," one of the most sacred territorial names of the chief Indian nation then inhabiting it.

[90] The whole of this poem of sixty-eight stanzas, in ottava rima, is printed in volume 2d of the Hakluyt Society's publications; it embodies the events described in Columbus's letter of March 1, 1493, to Raphael Sanchez, treasurer to Ferdinand and Isabella.

(1st Stanza.)

"Omnipotente idio, che tucto regge,
donami gratia chio possa cantare
allaude tua e di tua sancta legge,
Cosa che piaccia achi stara ascoltare
Maxim al popol tuo e alla tua grege,
el qual nō resta mai magnificare
Como al 'pēte ha fatto nella Spagna,
delle isole trovate cosa magna.

(14th Stanza.)

Hor vo tornar almio primo tractato
dellisole trovate incognite a te
in q̃sto anno presente q̃sto e stato
nel millequatrocento nov tatre,
uno che χρ'ofan Colobo chiamato,
che e stato in corte der prefecto Re
ha molte volte questa stimolato,
el Re ch'cerchi acrescere il suo stato.

(15th Stanza.)

Dicendo, signor mio, io vo cercare,
P che comprēdo che ce molta terra
che nostri antichi nō seppō trovare
E spero dacquistarle senza guerra,
se vostra signoria si vuol degnare
ajuto darmi che so que non erra.
lamente mia spera nel signore
chimbrieve cidare rengo e honore.

Translation.

"Omnipotent God, who rulest supreme,
Give me grace that I may sing
to thy praise and that of thy holy law
what will please him who listens—
especially thy people and thy flock
who never had so great occasion
in Spain, as now, of islands found
to sound the praises.

Now I turn to my first subject—
of the islands found, unknown to thee
in this present year this has happened
in fourteen hundred and ninety-three,
one who is called Cristofan Columbo
who has been at Court of the perfect King
And many times did urge him
to seek to increase his realm.

Saying, my Master, I wish to explore,
as I learn there are many lands
that the ancients knew no how to find
and I hope to acquire them without war
if your majesty will deign
to give me aid which will not be misused.
My mind hopes in the Lord
who will soon give us territory and honor.[61]

[61] Columbus died at Valladolid May 21, 1506. His remains were deposited in the priory of St. Francis in that city, and were transferred in 1513, to the Carthusian monastery of Las Cuevas in Seville. A few years later (1550) they were conveyed to Santo Domingo and buried in the cathedral of that city. After the lapse of 246 years (1796) what were believed to be the bones of Columbus were transferred to the cathedral of Havana, where they remained until 1899, when they were taken back to Spain at the close of the Spanish-American war. His male line became extinct and the title passed into the female line, and is now represented by the Duke of Veragua, one of the prominent nobles of Spain. There are 30 or more likenesses of him extant, no two of which resemble each other.

Vespucci's counterfeit fame obtained for him lucrative appointments on shore from the King of Spain, such as that of "Captain e Piloto Major de la Casa di Contractacion" at Seville, which was virtually a school of navigation, and later, Director of the "Deposito Hydrografico" of the kingdom—the first depot of charts ever established. His duties in the latter position were "to examine pilots in the use of the astrolabe and quadrant, to prove their acquaintance with the theory as well as the practice of navigation, to give them certificates, to receive payment from them for instruction, and to preside over the compilation of a sailing instruction-book to be named 'Padron Real,' which should receive constant corrections from information brought by pilots coming from the Indies, which information they were bound to supply to the 'Casa de Contratacion' at Seville." This admirable beginning (1508) of a system of hydrography, growing out of the necessities of navigation, is worthy of note in view of the tardy recognition of its importance by the great maritime powers of Europe. It was not until 1866 that a hydrographic office on a small scale was established at Washington.

All these and other early navigators, too numerous to mention here, were practical teachers of the seaman's art, and were trained to the business of exploration. "Once upon a time," says a writer in *Harper's Monthly* (1866) "men made a regular profession of discovering new countries. They were bound apprentices to it as if to a trade, articled to some past-master, and formally salaried by courts and princes for the specific service of adding Terranuovas to their employers' possessions. And they were fine men, those pirate-pioneers of the world's commerce,—the Cabots, Drakes, Tasmans, Da Gamas, and Columbuses. The class is not by any means extinct. But they have exhausted the world." Not to these remarkable men alone, however, was the development of the seaman's art due. Besides the mariner's compass, not wholly reliable on account of its variations, the awkward astrolabe, not reliable in a seaway, and the Ephemerides of Regiomontanus worked out only for a limited period, and the plane chart, erroneous in the proportion of more than one part in the thousand, there were needed other external aids to navigation, such as exact instruments and text-books, which only men of a mechanical or mathematical turn of mind could supply. "To know where one is at sea, in order to know whither one is going," says Edmond Paris, in his

"Musée de Marine du Louvre" (1883), "has always been and always will be a constant problem for the sailor."[a] This problem, now worked out with great exactness, was for centuries impossible of solution. Nor was it made any easier by the introduction of the mariner's compass, which merely fixed a constant direction for the ship.[b] It was also necessary to know the length of a ship's daily course, which was not ascertained until the introduction of the log-line in the seventeenth century. Not even the Portuguese, great navigators though they were, nor Columbus himself—facile princeps among seamen—could offer any solution of the difficulty, and as a last resource, it was referred by the Crown to the so-called scientists or learned men of that period. These were then classed as philosophers, astronomers and physicians, all the natural sciences, however, being regarded as cognate branches of the healing art. Hence we find in very high places, at different courts, accomplished medicists who were consulted by kings and princes in scientific matters, and who could write prescriptions and hygienic monographs in verse, or take part in abstruse scientific investigations. Some of them were Jews or Arabs familiar with oriental science, to which recourse was then always had, in the universities of Europe, in the solution of difficult problems in geography or astronomy. They were in fact the Admirable Crichtons of their day in Portugal, Spain and Italy. Everybody paid homage to doctors, whether in law or medicine, but the physicians were generally mere charlatans "skilled with arte of manslaughter," and exciting by their lofty airs and pompous manners the wrath of sensible men. The fashionable doctor of his day (1530) is thus pictured by Agrippa, doctor and philosopher, in his curious work "De Philosophia Occulta," "clad in brave apparaile, having rings on his fingers glimmering with precious stones, and which hath gotten fame and credence for having been in far countries, or for having an obstinate manner of vaunting with stiff lies that he hath great remedies, and for having continually in his mouth many wordes half Greek and barbarous. . . . . But this will prove to be true that the Physitians moste commonlye be naught. They

[a] It is said that Sebastian Cabota, in his last hours, raved about a new and infallible method of finding the longitude, which had been a subject of study in his years of health and strength.

[b] Cavallo, in his Treatise on Magnetism, shows that the variation of the compass was known before the time of Columbus.

have one common honor with the hangman, that is, to kill menne, and to be recompensed therefore." Petrarca, too, held these so-called doctors up to ridicule as "professional murderers, dressed in gaudy scarlet robes of silk embellished with priceless gems," and he would not permit any one of the craft to approach him in his last illness. But they heeded not the sting of satirical poets so long as they could hoodwink princes and extract enormous fees from confiding patients, in accordance with the code of ethics governing practitioners of the old school of Salerno:

> "Then always ask the patient for thy fee,
> Ere yet from danger he is saved and free;
> Since, when released from fell disease's claw.
> None pay the doctor till compelled by law.
> Hence 'tis that every costly drug is thought
> Much better of, for being richly bought;
> While from all skill which gratis we bestow,
> No usefulness is ever deemed to flow."

In fact, these wily disciples of Aesculapius understood better the vanities than the diseases of men, which fact accounts for the power they wielded, far greater than any modern practitioner could hope to acquire. In those days, the lucky medicists who effected the cure of prince or potentate, by drugs or magic, received almost royal honors. Taddes of the Florentine University was honored as a second Hippocrates; Tommaso del Garbo, the author of "La somma di tutta la medicina," was worshipped in Italy almost as a demi-god, and we find two of the fortunate ones, Mestre Rodrigo and Mestre Josef, both Rabbinical doctors, in the enjoyment of high favor as physicians and astronomers in the court of King John II of Portugal. This monarch rivaled his brother, Prince Henry, in his desire to improve the art of navigation, which then greatly needed for its development some method of preserving a certain course at sea by astronomical observations. To Rodrigo and Josef, more distinguished as astronomers than physicians, this problem was acccordingly referred for solution by King John, but with all their learning they were unequal to the task. Indeed they stultified themselves later by pronouncing Columbus's proposition to the king to sail westward "an extravagant absurdity." In 1479, however, Martin Behaim of Nuren-

burg,[a] a man full of resources, a mechanician, a cosmographer and navigator, arrived in Lisbon, and was at once employed by the king to co-operate with his physicians in solving the problem alluded to. Their deliberations resulted in the production of an improved sea astrolabe adapted to the purposes of navigation in determining distance from the equator by the altitude of the sun or stars at sea, which removed the last doubt in Columbus's mind as to the possibility of carrying out his plans of discovery. Of the construction of this most useful instrument—probably the work of Behaim's own hands—not much is known, as Major, who had access to all the old nautical treasures of the British Museum, describes it meagerly thus: "It was of wood, three hands-breadth in diameter, formed of three pieces like a triangle, and graduated roughly." It was inferior in style and finish to the ses-astrolabe that, unknown to European navigators, had been employed for over two hundred years by Arabian pilots in the eastern seas. In fact, the latter was called in Arabic "Asthar-lab." Evidently, says the authorities, a corruption from the two Greek words *αστηρ λαμβανω* signifying "to take the star." It was a flat, brass ring, about fifteen inches in diameter, graduated at the rim into degrees and minutes, fitted with two sights and with a movable index which turned upon the center and marked the angle of elevation. This instrument was conspicuously worn by Arabian astronomers and pilots as their badge of office, giving them a certain dignity and authority which the early Portuguese navigators did not fail to recognize. Indeed, in time, it came to be understood among mariners in general that those who used the circular astrolabe were the scientific navigators, in contrast with the humbler ones who contented themselves with the "Jacob's Staff" of later invention.

But rough and unwieldy though the quadrantal wooden astrolabe of Behaim may have been, it proved to be of great value to navigation, more particularly with the addition of tables of the

[a] During a visit to his native city, in 1492, Behaim constructed the famous terrestrial globe known by his name, the oldest existing one, and still preserved at Nurenberg. It was afterwards used by some of his zealous townsmen to support a claim that he had anticipated both Columbus and Magellan in their discoveries; but all the arguments adduced in its favor were shown to refer to Behaim's voyage with Diego Cam to the Congo river, which they discovered in 1486—See "Ghillany's Life of Martin Belhaim. Nurenberg, 1853.

declination of the sun, first reduced by Behaim. In this connection we have the testimony of the great Professor Pedro Nunez in 1537, "Vulgatum instrumentum quadrantis quo nautae utuntur, aptissimum est ad altitudines solis et aliorum astrorum Capiendas." It is interesting to note also that it appeared in time (1480) to be used in the first long voyages of Diaz, Da Gama, and Columbus. In proof of this, a picture in an old nautical work represents Columbus on the deck of his caravel holding a huge quadrant or astrolabe in his hand. It must be stated, however, that Humboldt, in his Cosmos, questions the originality of Behaim's invention, which he describes merely as a simplification of the "Meteoroscope" of the great astronomer Johann Muller of Koenigsburg (surnamed Regiomontanus), the friend and teacher of Behaim. It appears too that the astrolabe in some form dates back to a remote antiquity. Messahala, a learned Rabbi at the court of Khalifah Almumum, in the eighth century, wrote a treatise on it, which was translated into Latin. Adelard, a monk of Bath, England, wrote about it in the first half of the twelfth century. Moreover, Octavius Morgan, in his account of the astrolabe, states that in a manuscript of the thirteenth century, entitled "Le Breviaire de St. Louis" there is an illuminated picture of a lesson in astronomy representing the teacher in the act of taking an observation with an astrolabe which he holds in his left hand whilst he is taking a sight through the holes in the ruler of the instrument. It is also described by Raymond Lulle, a Majorcan philosopher and alchemist of the thirteenth century, in his "Arte de Navegar" and his contemporary Andalone del Nero, a Genoese professor of astronomy, made it the special subject of a work entitled "Opus praeclarissimum Astrolabii," which was first printed at Ferrara in 1477. Robertus Anglicus, in 1390, wrote "De Astrolobio canones Incipient." There is also an elaborate description of this instrument in a metrical treatise, entitled "Tractatus de conclusionibus Astrolabii," written in 1391 by Geoffrey Chaucer, (printed in 1542), for the instruction of his son Lowys, in whom he discovered a talent for the sciences. This is said to be the oldest treatise in the English language on any subject pertaining to nautical science. Nicholas de Lynne, a Franciscan friar and Oxford professor, wrote about 1364, "De usu Astrolabii." Another

"Petri nonii Salaciencis Opera."

Oxford professor, William Batcombe, wrote "De operationes Astrolabii." At a later period (1513) Stoffler, a German astronomer, published the first extensive work on this instrument, entitled "Elucidatio Fabricae Ususque Astrolobii,' which was followed in 1537 by an interesting paper by the renowned Portuguese, Pedro Nunez, on the instruments of navigation, including the astrolabe, which he most minutely described. Afterwards appeared the treatises "De Radio Astronomico Geometrico liber" (1540), "De Annuli Astronomici usu" (1548), and "De Astrolobio Catholico et usu ejusdem" (1556), by Gemma Rencrius, surnamed Frisius,* a Flemish astronomer and professor of medicine in the University of Louvain, and other treatises by Clavius of Bamburg and Henrion of France of later date. Stoffler constructed an astrolabe of his own design, which according to the testimony of Blundeville, writing in 1594, "had been in most price and estimation for these one hundred years." But Stoffler was a better mechanician than astrologer, as he lost his reputation in the latter capacity by his false prediction of a deluge for the year 1524, in anticipation of which many ships and arks were built. The catholicon, described by Frisius in the treatise just mentioned, was also invented by him, and was afterwards (1585) improved by Maister Blagrave under the name of the "Mathematicall Jewell," which he described in an interesting pamphlet. These improved instruments served many more purposes than the original mariner's ring, which was used mainly to take altitudes of the sun, or of a star or planet.

It suffices for our purpose to have indicated some of the authentic sources of information regarding the construction and manifold uses of the various forms of the sea-astrolabe. From the testimony of the earliest writers alluded to, it is apparent that this useful instrument had been known two hundred years prior to the time of Behaim and even of Prince Henry the Navigator. Doubtless it was originally invented and first used by the ingenious Arabs, although like the rude floating compass of Guyot's time, also probably of their invention, it did not come into general use among European navigators for a long time. The probable sea-astrolabe here spoken of, differed entirely in form and use from the ancient

*Gemma, the Frisian, invented a new Cross Staff in 1545, and also wrote his "Principiis Astronomice," in which he mentions *watches* as a new invention for determining the longitude.

astrolabe invented by Hipparchus in the sixth century before the Christian era, which, like that of Ptolemy, in the second century A. D., was used only for astronomical or astrological observations on shore, and like all such instruments of the ancients, was fixed immovably upon the plan of the horizon. This instrument, resembling somewhat the modern armillary sphere, is fully described in the "Tractatum Astrolobii,' 'written in the thirteenth century, by no less a personage than the Emperor Frederick II of Germany, one of the most eminent geometricians and medical scientists of his day. It is also described in the treatise "De torqueto Astrolobio Armillari," by Johann Muller, surnamed Regiomontanus.[87] and in the "Canones Astrolobii," by his contemporary and teacher Georges Purbach,[88] both of the fifteenth century. It is also described by Pedro Nunez, already alluded to, who thus distinguishes the former from the later instrument: "Utuntur nautae pendulis astrolabiis quia non possunt in mari quietum stabilemve habere horizontem. Prisci vero astronomi omnia instrumenta quibus astra observabant, super librata facie horizontis erigebant." It may be mentioned here that the sea-astrolabe used by Sir Francis Drake is preserved in the Royal Naval College at Greenwich, England, and in the British Museum there is exhibited a beautiful planisphere-astrolabe, constructed for Shah Sultan Husain Safawi, King of Persia.

The earliest known description of the Jacob's Staff, the "Arbalete" or "Baton de Jacob," which finally in a measure superseded both the quadrantal and circular astrolabe, on account of its greater steadiness in the hands of an observer, is found in the "Margarita Philosophica," the first edition of which was printed in 1496. It is also described in Werner's Latin version of Ptolemy's Geography (1514), in the treatise "de Radio Astronomico," by Gemma Frisius (1545); in Blundeville's Exercises (1594), and in

[87] It was Regiomontanus who calculated the astronomical Ephemerides for the years 1475 to 1506, being the first known Almanac-Calendarium Novum, which were used by the great navigators of that period.

[88] Purbach was born at Liuz in 1423. He was professor of astronomy at Vienna, wrote astronomical treatises, and constructed many astronomical instruments. His text-books were used by Spanish students for 200 years.

Bourne's "Treasure for Travailers."* As sketched in the precious manuscript "Les premières œuvres de Jacques Delvaux, pilote de la marine, l'an 1583," it consisted of a long ruler and three shorter ones, the latter being placed at right angles to the former, so as to be moved at will up or down according to the angle of elevation. It was preferred by many pilots to the astrolabes, which were affected somewhat by the motion of the ship. The Jacob's Staff, Baculus Jacobi, Cross-Staff, Fore-Staff, Radius Astronomicus, Ballastell, Bella-Stella, Croix Géometrique, Verge d'or, Baton de Jacob, and Arbalete were different names for the same instrument. Some antiquarians derive its crucial form from the supposition that the staff of the patriarch Jacob was a cross, carried by him as a symbol of the coming Christ. The instrument was found to be useful also for land surveying, as appears from the lines of Sylvester's Du Bartas, 1621:

> "The Jacob's staff, to measure heights and lands,
> Shall far excel a thousand nimble hands,
> To part the Earth in zones and climates even,
> And in twice twenty—and four figures—Heaven."

It may be stated, too, as a singular fact, that the Jacob's Staff was used in the common hedge-schools of Ireland until a recent period, "Surveying and the use of the Jacob's Staff," being mentioned in an advertisement among the qualifications of a hedge school-master.

But all these nautical instruments and others of earlier date could determine only one of the two elements necessary to fix the location of any place on the globe. They gave only the latitude, so that even down to the eighteenth century errors in longitude from twenty to fifty degrees were commonly made. The greatest of the fifteenth century navigators made gross errors in longitude, but their faith in themselves and in their nimble caravels helped them out of many a predicament.

*Tycho Brahe, the celebrated Danish astronomer, made his first observation on May 1, 1564, with his Radius Astronomicus, to which instrument Kepler attributed the great progress of astronomy. It was made of a light graduated rod, three feet long, and another one of half that length. At the center, the short rod slid along the longer one, thus making a right angle, which however was not always accurate. Tycho Brahe's Observatory, called Uraniberg (the City of Heaven) on the Island of Hucan, completed in 1580, was the wonder of the astronomical world. See sketch of it in "Catholic World," August, 1895, page 597.

Even the inferior type of vessels sailed by the Arabs was described by Père George Fournier (1668), in his rather extravagant way, as "the most beautiful in the world." He also affirmed that "it was the Arabs, so far advanced in the sciences of the sixteenth century, who in consequence of their wars with the Portuguese gave to the French their first types of sailing vessels." A later and more competent authority upon this subject, Auguste Jal, in his "Archéologie Navale," waxes indignant at the manner in which commercial and war vessels of the middle ages,[79] and even of a more recent period, were belitted by some writers. He asks if it can be believed that the people who built the temples of San Sofia and San Marco, or the churches and castles of the middle ages, built ships without art or rules. "Nor was it barbarous art which preserved the traditions of the ancient art, and gradually prepared the nations for the modern art of shipbuilding." There were huge and well-built vessels in those early days. Saint Louis returned from the Holy Land in a stout ship of 1500 tons, carrying the royal family and retainers with eight hundred pilgrims besides the crew. A Venetian three-masted ship "ingentis molis" is reported to have carried fifteen hundred refugees from Constantinople to Venice in the twelfth century. Some of these so-called "long vessels" had the capacity of old-fashioned ships-of-the-line of ninety guns, and they were propelled by oars and sails, the short, round vessels being propelled by sails only. Jal writes enthusiastically of certain Portuguese carracks of the sixteenth century of from 1500 to 2000 tons with four decks carrying forty guns and 1000 sailors, soldiers and passengers. But the pride and wonder of that century was a Venetian galleon carrying 300 pieces of artillery, 500 soldiers and a large crew, which was lost in a terrible storm in the Adriatic. These marvelous vessels, like all others of previous times, were built by men who knew only the practice of the art. The Portuguese and Spaniards, although great navigators and explorers, built their ships by rule of thumb,

[79] "The great work of Pantero-Pantera, entitled "l'Armata Navale," published at Romę in 1614, is the standard authority concerning ships and armaments of the middle ages. "Les Branches au Royaux Lignages," written in verse in 1306 by Guillaume Guiart—one of the oldest records in the history of the French navy—gives a very accurate description of the naval tactics and maneuvers of that period, as illustrated in the naval action of 1304 between the French and Flemings. This memoir is printed in M. Legrand's "History of the Arts and Sciences in France."

making but little progress in modelling or construction. Indeed, "There was no revolution in the art," says Jal, "until mathematics became the basis of shipbuilding, and even then many errors were committed and are still committed by scientific naval architects."

Not less remarkable was the art of navigation as practiced down to the end of the fifteenth century with only two primitive instruments and a few erroneous charts from which but little aid could be derived. In the face of obstacles that would have demoralized any but the stoutest hearts, great discoveries were made by Portuguese, Spanish and Italian mariners whose services the world has not yet ceased to admire. They were, indeed, veritable "Sea Fathers,"[n] splendid types of daring men; with all the high qualities necessary for the work they had to do. We can hardly realize the boldness of Magellan's undertaking to circumnavigate the globe, unfortunately interrupted by his death at Mactan, in the Philippines, but the most skilful of his pilots, Sebastian del Cano, "pursued the voyage in a leaky little craft of eighty tons, the *Victoria*, masted like a Retch or Yawl, but with square sails on both main and mizzen masts, and nothing but a spritsail to pay her head off." Great was the rejoicing at Seville when, in 1522, she returned there three years after her departure from that port, having sailed over 42,000 miles by the ship's reckoning. "And yet," says Markham, "the knowledge of navigation possessed by del Cano and other pilots of Magellan's fleet, was very little in advance of that in the days of Columbus; but the number of expert and bold navigators was increasing yearly, and it was their practical observations at sea that suggested expedients and improvements in the art of navigation." It was already evident, however, to advanced minds that the aid of mathematics and astronomy was necessary to further success in the art, and nobody was more convinced of this than Charles V himself (son of Ferdinand and Isabella), whose scholarly spirit induced him later to abdicate his throne and seek the seclusion of a monastery for the purposes of study. During

[n] This is the appropriate appellation given to the early navigators by Clement R. Markham, in his interesting work entitled "The Sea Fathers, or a series of Lives of the Great Navigators of former times, London, 1884," from which we quote freely in these pages, and which was frequently republished.

his reign he left nothing undone to advance the seaman's art, and proud of the achievement of the great seaman del Cano, he rewarded him with a life pension, and ennobled him with a coat of arms having a globe for a crest and the appropriate motto "Primus me circumdedisti." Prompted perhaps by his learned physician, Nicolo Oresme, who wrote a treatise on the sphere, and refuted the theories of the astrologers, Charles, in the early part of his reign, founded a course of lectures at Seville, with the object of enabling experienced astronomers and pilots to give the world the benefit of their knowledge. These lecturers, and students of all classes at Seville, had the benefits of the famous Columbine Library of over 15,000 volumes of rare treasures of bibliography, collected by that ardent lover and reader of books, Fernando, the illegitimate son of Christopher Columbus; but it will hardly be believed that this valuable library has been systematically robbed, leaving but a mere fraction of it now extant.[72]

Charles not only encouraged the publication of facts and theories relating to nautical science, but also provided students of navigation, and pilots, with suitable instruction on shore during a three years course of study, with an examination at the end of each year. This was a severe ordeal for that time, but the results must have been good, as learned mathematicians, such as Rodrigo Zamorano and Alonzo and Geronimo de Chaves, wrote books for the students between 1560 and 1590, and superintended the examinations. Markham gives the programme of studies as prescribed by the Cosmographer of the Indies, in 1636, as follows:

First year. Subjects—1. The Sphere of Sacrobosco, author of a treatise on the system of Ptolemy. 2. The four rules of arithmetic, rule of three, extraction of square and cube root and fractions. 3. The Theory of Purbach, or planets and eclipses. 4. The spherical trigonometry of Regiomontanus. 5. The Almagest of Ptolemy.

Second year. 1. First six books of Euclid. 2. Arcs and chords,

[72] In Appendix A of the voyages and works of John Davis, printed for the Hakluyt Society in 1880, is a full list of works relating to the art of navigation previous to and during the age of Elizabeth. As this list was made in 1880 with the aid of the rich treasures of the British Museum library, it is likely to be authentic, and we have used it in these pages to verify and correct when necessary a list of our own made many years previously, and derived from authorities not in such close contact with the original sources of information.

right sines, tangents and secants. 3. To complete Regiomontanus and Ptolemy.

Third year. 1. Cosmography and navigation. 2. Use of the astrolabe. 3. Methods of observing the movements of heavenly bodies. 4. Use of the globe and of mathematical instruments. 5. Construction of a watch.

Pedro Nunez was born in 1497 at Alcazar, the Latin name for which is Salaciencis, and died in his eightieth year. He was charged with the education of the son of King Emmanuel of Portugal, and afterwards became Cosmographer Royal and Professor of Mathematics at the University of Coimbra, where he wrote many papers relating to difficult problems of navigation, nautical instruments and inventions, geometry and chart-making, which were published at Basileae in 1592, under the following title, "Petri Nonii Salaciencis opera; Quae complectuntur primum, Duos Libros in quorum priore tractantur pulcherrima problemata, in altero traduntur ex mathematicis disciplinis regulae et instrumenta Artis Navigandia, &c." An excellent copy of this rare work is to be found in the Congressional Library at Washington. In the other treatise mentioned above, he investigated the Plane Chart, which he boldly condemned on account of its serious errors.

In another paper he suggested a method of finding the latitude by two altitudes of the sun, and announced the great fact that in sailing from one port to another distant one, the shortest course must always be along an arc of a great circle of the terrestrial sphere.

In the paper "De Crepusculis," his device for subdividing the arcs of quadrants and other astronomical instruments was first promulgated. Opposed to him in the matter of the plane chart was Medina, the Spanish author already mentioned, who warmly defended it in his text-book, which, in Italian, French, English and Flemish translations was used to some extent by navigators of those nationalities.[n] Medina found another adversary in Michael Coignet, a native of Antwerp, who in 1581 exposed his errors in a book entitled "Instructions Nouvelles des Poincts, plus excellens et nécessaires touchant l'art de naviguer." Coignet also devised a way of sailing on a parallel of latitude by means of a ring dial and a twenty-four-hour glass. Other Spanish nautical works of

[n] Medina's work translated into English by John Frampton, 1581.

this period were that of the Franciscan monk Guevara, published at Valladolid, 1550, and translated into English by Edward Hollowes, 1578, under the title "A very Necessary and Profitable Booke concerning Navigation, 1579; the Hydrografia o arte de la navegaçion," (Bilbao, 1585,) by Andrez de Peca, and the "Compendio dell' arte de Navegar," (Sevilla, 1586,) by Rodrigo Zamorano, cosmographer, who also published a "Carta de Marear," 1588.[*] But the favorite text-book, especially in England, was that of Cortes, who, like Nunez, vigorously attacked the plane chart. This book, translated into English in 1609 by Richard Eden, the most enthusiastic nautical student of his day, was adopted by the mariners of the British Isles, who were then awakening to the importance of scientific aids to navigation, and were soon to contest with Spain the dominion of the sea. The indebtedness of England to the early navigators is thus handsomely acknowledged by Markham: "Great as England afterwards became, and completely as her maritime superiority was established in succeeding centuries, we ought not only to remember that we owe a great deal to the Spanish pioneers who went before us, but also to continue to derive benefit from their labors, by studying and reflecting on the work they did, and on the way they did it." Not less indebted were the Dutch, who learned navigation from the Spaniards, improved their text-books, invented several nautical instruments, and excelled during a long course of years in the construction of admirable globes, sea charts and atlases.

Thus we find, from abundant records, that the first successful voyages into unknown ocean waters, under the guidance of the compass, were made by Portuguese and Spanish navigators, and that the earliest text-books of the seaman's art were written by

[*] In 1577 Luc Jansen Waggenaar, pilot of the city of Enckhuysen in Holland, wrote in Dutch of the art of navigation and pilotage. He published charts of the Dutch harbors, and in 1584 appeared at Leyden his sea charts, collected together in the first marine atlas ever printed. In 1592 appeared a French edition of this valuable work, under the title "Tresor du Navigateur, ou Itineraire pour toutes les mers avec les cartes y relatives." Romano, in his History of Florida (1775), states that the book above mentioned was spoken of in his day as "The Waggoner," and that coast pilots published subsequently were called "Waggoners." The "Chronicle of Holland," a book on navigation,—translated into Dutch from the Spanish of Medina, by some Dutch student of science, was found among the effects of the arctic navigator Barents in the hut in which he lived.

men of those nationalities. But these pioneers, although full of practical resources, failed to provide a substitute for the erroneous plane chart. This triumph was reserved for the celebrated Dutch geographer, Mercator, a pupil of Frisius, who laid the foundation of correct marine cartography. The plane chart was seen no more after the introduction, in 1569, of Mercator's Mappemonde or Universal Map, which contained an entirely new and scientific method of projecting a sphere upon a plane surface. It is said that Mercator constructed his map without a knowledge of the principles governing the formation of parallels of latitude, but he is entitled to the credit of solving one of the most difficult problems of that day, viz., "how to sail in a straight line over a curved surface." The Mappemonde did not find favor with other map-makers for many years, but ultimately it replaced all others."

At this point in our researches, we happened to find in Jal's "Glossaire Nautique" (page 488) the following statement in regard to a "Naval College" in Venice in the middle of the sixteenth century under the direction of Cristoforo da Canale, which, if substantiated would place the Venetian Republic of that day in the van of all the nations in the record of nautical education:

"Collegio della Militia da Mar. Venit—s. m.

"College où la jeune noblesse venetienne apprenait le metier de la mer. vers 1558, Cristoforo da Canale qui avait été provediteur de la flotte en 1556, dont les écrits sur la marine jouierent d'une grande réputation dans la dernière moitié du XVI siècle, en était le directeur, comme nous l'apprend cette phrase p'7 de la Relatione del Claris. Cristof. da Canal, ms. ant. in 18. sur papier que nous possedons—"Et ciò sara nel collegio della Militia da Mar dove pér summa benignità della subl. vostra et delle S. V. illustriss. son presidente."

In the hope of obtaining further information about his school we consulted such Venetian records as were within our reach, but nowhere could any trace of it be found. Of its supposed director, the illustrious Admiral Cristoforo da Canale, there is frequent mention in Venetian history, wherein he is described as "a man of great and vigorous mind, admirably adapted to the conduct of maritime affairs, in which he acquired much reputation, and to ex-

"Judge Daly, to show how little is known regarding Mercator, even by nautical men, says that upon speaking about him to a distinguished English admiral, the latter seriously asked if there ever was such a man as Mercator, adding that he always interpreted "Mercator's projection" to mean the "Merchant's" projection. (Daly's lecture on Maps.)

cel in naval studies to which he was bred from a tender age." Surely this accomplished officer, without a peer in his day as naval commander, was peculiarly fitted for the direction of a naval training school. But as his biographer, Capellari [76] makes no allusion whatever to such a school, the inference must be that it was suggested to Jal by a misapprehension of facts in Venetian history, or by a misinterpretation of the Italian phrase "Collegio della Militia da Mar," which he makes the text of his statement. Years ago, by the courtesy of Mr. Frelinghuysen, Secretary of State at Washington, under President Grant's administration, and by the friendly zeal of the United States Consul at Venice, at that period, we were furnished with authentic copies of certain Venetian documents [77] which enable us to correct the error into which the usually reliable Jal has fallen in this case, and to give some interesting information in regard to the earliest attempts at naval education in Venice.

In a work evidently exaggerating the geographical and scientific discoveries of his countrymen, entitled "Saggio sulla Nautica de Veneziani," [78] published in Venice in 1743, Vincenzo Formaleoni claims that Venetian mariners of the twelfth century used a compass, sea charts, and a system of sailing tactics (Martelojo's), and that trigonometry was first applied to navigation by the savants of Venice. It appears, too, that there was brought to his notice, in the library of San Marco, the long forgotten Portulano or collection of coast charts made by Andrea Bianco, already mentioned, the authenticity of which was proven by the following Latin inscription on the first page, "Andreas Bianco de Venetiis me fecit, 1436," thus antedating the discovery of America fifty-six years,

[76] Capellari mentions a manuscript "Treatise on Maritime Warfare," as the only work by Canale that is extant in the Marciana Library at Venice.

[77] Memoir of Cristoforo da Canale, by Capellari, "Petition of the Master Claris to the Doge (1673)," "Decree of the Senate in relation to the project of Claris (1675)," "The instruction of Apprentice-mariners," "Report of the Venetian School Board," "Decree of the Senate relating to the appointment of teachers (1710)," "Letter to the Venetian Ministers at the Hague and in England (1710)," "Scheme of Organization of the School of 1739," "Report of its condition by Captain Siron."

[78] This book was copied almost entire into the Encyclopédie Méthodique and the Dictionnaire de Marine, without even the mention of Formaleoni's name. His other works, written in a similar vein, are entitled "Storia filosofica e politica della Navigazione" (1788), and "Illustrazione di due Carte antiche della Biblioteca di San Marco che dimostrano l'isole Antillie prima della scoperta di Cristoforo Colombo."

which was their principal merit. Formaleoni copied three of those charts into his book, in one of which, at the farthest limit of navigation known to the Venetians, there was laid down the island of Antillia, resembling so nearly in name the Antilles group of the West Indies, that the too sanguine Formaleoni was led to claim their discovery by his countrymen before the time of Columbus. But it was shown by Buache that Antillia was one of the Azores discovered by the Portuguese, being so laid down on Pizzigani's chart of 1367 and on Behaim's globe at Nurenberg (1492). The first chart of Bianco's Portulano, used as the frontispiece of Formaleoni's book, is considered a precious monument of nautical science, as it contains a representation of a compass, of geometrical figures and of certain nautical tables, which seem to show that the navigators of Bianco's time (1436) made use of calculations and graphical operations to ascertain the daily run and track of their vessels and the place on the globe where they might happen to be. Moreover, each chart contains a scale for the measurement of distances, which operation was of course attempted without any knowledge of the longitude, then not discovered.

We also read of a school of geography in Venice with which is connected the name of the learned monk Fra Mauro, called "The Incomparable" by his contemporaries, whose great skill as a cartographer has already been alluded to. But this so-called school must have been merely a repository of facts, chiefly concerning the land surface of the globe, obtained by Marco Polo and other travelers who compiled itineraries and maps for the guidance of adventurous spirits of a later date.

We can find no evidence that the early navigators or astronomers of Venice gave to the world any text-books of their arts, or sea charts, other than the coast-pilots and Portulanos mentioned elsewhere, or made any important discovery in nautical science,"

"In an old catalogue of St. Mark's Library, in Venice, there are entries such as these,—"Trattato di Nautica by Riversi Pietro, 1444," 'Compendio dell' Arte di navegar, 16th century," (no author given); "Mello Antonio, Arte del Navegar, 16th century," but it is not stated that they were Venetians. Two works by Venetians of the 16th century are recorded, viz., "De ventis et Navigatione Libellus, by Michel Angelo Blondus, Venezia, 1546," and "Navigationi e Viaggi," by Giovanni Ramusio, Venezia, 1550." Other nautical works of the 16th century, by Italians, are,— "De re Nautica," by Gyraldi di Ferrara, 1540, "Nuova Inventione sopra il modo di Navigare," by "Camillo Agrippa, Roma, 1595," and "Modo di usare il Rossolo," by Appol Calderini.

excepting the not well substantiated claim put forth by Formaleoni. Nor did the Venetian government take any part in the oceanic explorations of the fifteenth century. Yet it was Italian navigators—Colombo, Vespucci, Verrazzani, Cabota, and others —who far surpassed the Portuguese in the extent of their maritime knowledge and exploits. They discovered the whole of America, says Major, "but not a foot of its soil were their governments able to retain in perpetuity." So far as Venice was concerned, her ambition was wholly directed toward the maintenance of her commercial sway in the Mediterranean sea, and she evidently cared but little for the advancement of nautical science in so far as it tended to aid her schemes of conquest. This perhaps induced one of her distinguished mariners, John Cabota, to settle in Bristol, England, where was born his son Sebastian, who became one of the most renowned of England's navigators. Only a few names of Italian early writers are recorded in the books mentioned.

At the period (1558) at which the supposed naval college is brought to our notice by Jal, the proud republic had been shorn of much of her power and territory, and her commercial laurels had passed to other nations, so that in the records of the time, we find lamentations of the decay of her skill in the art of naval construction. So also in our day, twenty years after the prodigious rise of our navy during the War of the Rebellion, we find one of our leading writers, Howells, in his "Tuscan Cities," lamenting its decay while writing thus of Pisa of the middle ages, "Even now her shipyards by the Arno, from which her galleys were launched, do really recall the majesty and dominion of the sea which was hers—and then Genoa's, and then Venice's, and then the Hanseatic cities, and then Holland's, and then England's; and shall be ours when the Moral Force of the American Navy is appreciated. At present Pisa and the United States are equally formidable as maritime powers, unless indeed this conveys too strong an impression of the decay of Pisa." Perhaps the cutting irony of this latter statement may have contributed somewhat to the awakening of our legislators, and to the rebuilding of our navy now happily far advanced towards what it ought to be. But Venice, even in the days of her decline in shipbuilding, achieved her greatest triumph in that department as late at 1529. The then famous Maestro Vittore Fausto, a man of genius, successively a professor of Greek and Latin, public lecturer in Venice, mathematician and naval

constructor, undertook in that year to build a gigantic quinquireme, a model of vessel not used since the time of the old Romans. His bold project was opposed by senators who were influenced by the jealous "Protomastri," or master-carpenters of the Arsenal,[*] but the huge vessel was built and equipped in the Arsenal[*] and a trial of her speed with oars, in competition with a fast galley of the usual model, took place on the lagoon in the presence of the doge (Andrea Gritti) and the whole population of Venice. Vittore Fausto was, of course, in command of his quinquireme on this occasion, and by skilful management, he won the race. He received a great ovation from the people, and the doge wept with joy at the success of this wonder of the world, "Maraviglia dell' universo mondo." It is a singular fact, says Jal, that not a trace of the timbers or drawings of this remarkable vessel could be found in the great library of San Marco, in 1754, by the most industrious of naval archæologists.

Another day of memorable triumph was yet in store for Venice when the gallant septuagenarian, Admiral Sebastiano Viniero,

[*]The Arsenal of Venice was a vast depot for the storage of complete assortments of all the component parts of a ship. It contained over one hundred ship-houses in which war vessels not in commission were sheltered, eleven armories, foundries that had been directed for many generations by the Alberghetti family, extensive rope-works, huge workshops, stores of timber, provisions and munitions of war. Du Sein informs us that, during a visit to the arsenal of Henry III, on his way to take possession of the French throne in the 16th century, the Protomastri and their workmen put together all the detached parts of a large galley, including her rigging, in less than two hours.

[*]Knolles, in his General History of the Turks, gives the following description of the Turkish admiral's galley captured at Lepanto,—"She was so goodly and beautiful a vessel that for beauty and richnesse scarce any in the whole ocean was comparable with her. The decke of this galley was on both sides thrice as great as any of the others, and made all of blacke walnut-tree like unto ebony, checkered and wrought marvellous faire, with divers lively colours and variety of histories. There was also in her, divers lively counterfeits, engraven and wrought with gold with so cunning a hand that for the magnificence thereof it might well have been compared unto some prince's palace. The cabbin glistened in every place with rich hangings wrought with gold twist and set with divers sorts of precious stones. . . . Besides this there was also found in her, great store of the Bassa's rich apparrell wrought with the needle, so curiously and richly embossed with silver and gold that his great lord and master, Selymus himselfe could hardly put on more royal or rich attire."

fresh from the battle of Lepanto (October 5, 1571) sailed up the Grand Canal with a Turkish standard trailing from the stern of his battered galley. It is related of this glorious veteran that on seeing the Turks boarding his galley, he took off his iron armor, clothed himself in a buff doublet and with his feet wrapped in cloth sandals so as not to slip in blood, seized a two-handed sword and mowed down the terrified Turks until "he had purged his Christian ship of the infidel defilement."

These were the expiring efforts of a proud national spirit almost broken by a cumulation of disasters. Venice was no longer the arbiter of the Mediterranean in the sixteenth century. The discovery of the Cape of Good Hope route to India destroyed her commercial supremacy. Her arsenal no longer resounded with the din of shipbuilding; her only vessels of combat were still the old-time galleys propelled by oars, and the so-called "Collegio della Milizia da Mar" instead of being, as Jal supposed, a school of naval training, was merely a branch of naval administration corresponding to one of the bureaus of our Navy Department. Established in 1545, the Collegio was composed of several senators, who were charged with the enrollment of seamen, the appointment of their officers, the apportionment of the contingents to be furnished by the different provinces and fraternities of the republic, and later, when these obligations were partially commuted into contributions of money, the Collegio superintended the repartition, collection, and expenditure of such contributions. That Canale was the president of the "Collegio" at the time in question is probable, although his biographer does not state the fact. But the point is immaterial, as our informants state that his holding of that office could not have been for any educational purpose. Indeed it is not until late in the eighteenth century that we find mention of any scientific nautical instruction given in the arsenal. In the revival of letters in the middle ages, Venice was foremost among the nations, her famous University of Padua[82] being the distributing

[82] The other Italian universities of this period were at Bologna, Siena, Ferrara, Pisa and Perugia. At the University of Bologna there were 13,000 students of various nationalities attending lectures on law, medicine, philosophy and letters. The rectors of these universities were entitled to golden fasces to be borne before them as an emblem of their dignity, and they wore scarlet robes trimmed with gold. It was considered bad form for a lecturer to use notes, the memory alone being relied upon, and one professor died of shame on losing his memory. Students used note-

source of the great masterpieces of ancient wisdom. But the application of science to the practical uses of life, or to the art of navigation, was not thought of by the Venetians until the period of the decline of the republic. In fact, scientific navigation or warfare was not necessary either to the genius or situation of the ancient Venetians. Their home was in the narrow seas, where no science was needed to show the mariner the friendly headland under which he furled his sail at evening, or to thread his way among the clustering islands with the morning light. Here, too, all the science in the world was of no avail to save him from the threatening storm from which then, even as now, the prudent navigator sought shelter in the nearest ports of refuge. Their warfare was a game of ambushes and pursuits among the treacherous bays and inlets of the serrated coast, or a hand-to-hand struggle on the decks of their galleys when they grappled with corsair or regular armed cruiser for mortal combat. To conquer their enemies, the Venetians needed not science but daring, the prudence, and the valor that built up the greatness of their republic, and maintained it against the world for a thousand years.[82] Petrarch, the laureate, who resided on the Riva degli Schiavoni, commanding the harbor of Venice, thus described what he witnessed daily from his windows: "From this harbor I see vessels departing which are as large as my house, and have masts taller than its towers. They are like mountains floating on the waters. They sail to all parts of the world, and face a thousand dangers. They carry wine to England, wine to the Scythians; saffron, oil, linen to Assyria, Armenia, Persia and Arabia; wood to Egypt and Greece. They return laden with various merchandise, which is distributed over all Europe. Where the sea stops, their sailors quit their ships and travel on to trade with India and China; they cross the Caucasus

books which copyists transcribed and ornamented with illuminated monograms. The students wore an academic gown of black cloth and a cap; there were frequent fights between "Town and Gown," as in our day, and when refused a holiday they made a bonfire of their books. A student in love with the niece of a professor was decapitated by sentence of a municipal court for having carried her off. See "Italian University Life in the Middle Ages," in the British Quarterly Review, July, 1884.

[82] At the height of her power in the 15th century, Venice had 3000 vessels of all sorts in her commercial marine, while her fighting force consisted of 300 armed vessels manned by 19,000 hardy seamen.

and the Ganges, and reach the Eastern Ocean."[84] Such indomitable energy on the part of her commercial marine, coupled with the daring and heroism of her fighting seamen, made Venice the Queen of the Adriatics.

What nation, what navy, would not be proud of such commanders as Zeno, Pisani, Canale, Contarini, Viniera, the brothers of Mocenigo, and Francesco Morosini, the last of this line of seamen, who without the aid of accurate chart or chronometer maneuvered fleets of from fifty to two hundred sail in the most dangerous inland seas, and won victories as brilliant as any recorded in naval annals; of captains of single galleys, such as Morosini, who gallantly resisted the attack of forty-five Turkish galleys in the Strait of Negropont; of gunners, such as Jeronimo Maggi, who, while conducting the defence of Famagosta, in Cyprus, against an assault of the Turks, rendered eighteen of their cannon unserviceable by shooting projectiles into their very muzzles; and of engineers such as Sorbolo, who transported a flotilla of galleys from Venice to the Lago di Garda, a distance of two hundred miles through difficult inland navigation and across forty miles of undulating land—a triumph of engineering skill without a parallel in history. The late Commodore Foxhall A. Parker, a high authority in our navy, extols the strategy and tactics of the old Venetian and Genoese Admirals, and states that perhaps "there has been no better regulated and organized navy than that of the 'City by the Sea.'"[85] And how terrible were these sea-kings in battle. We read of victors standing ankle deep in the blood of the vanquished, of the sea being incarnadined for miles, and of the air being poisoned by the numerous corpses floating on the shore. Such was the terror inspired by these sea-warriors that a dignified Ambassador of France,[86] addressing the German Diet, stigmatized them as "Brides of Neptune, or husbands of Thetis, who espouse the sea by a ring, a folly unheard of among other naval powers, but worthily adopted by these insatiate whales, infamous corsairs, pitiless Cyclops and Polyphemi, who on all sides besiege the ocean, and are far more to be dreaded than any sea-monsters, quicksands, sunken rocks or hurricanes." Such

[84] Historical Sketch of Venice, by H. F. Brown, 1895.

[85] Parker's "Fleets of the World," 1876.

[86] Louis Helian, at the Diet of the German Empire, convened by Maximilian, in 1508, at Cambrai.

were the iron-clad men who for centuries lorded it over the Mediterranean, the historic sea—

> "To science sacred, where we find
> All that informs and dignifies mankind,
> On whose fair borders and surrounding shores,
> The eye each source of worth, of fame explores."
> (*Pye's "Naucratia," 1798.*)

Before the fifteenth century, the only training for maritime life insisted upon by the doges, especially for young patricians, was that they should make frequent voyages and obtain a knowledge of the laws and customs of other nations. The historian Contarini* informs us that in the grand days of Venice there were not less than two hundred young men of noble birth constantly exercised in the arsenal and in the state galleys in the arts of seamanship and of naval warfare, so as to be prepared for any emergency. But there was no thought of gathering into a body of doctrine the knowledge and experience of the great captains under whom they served, or of attempting to instruct young officers in the theory of the seaman's art, until 1673, when a certain Giovanni Claris, a native of Flanders, called the attention of the Serenissimo Principe, or doge of that period, to "the neglect in which the nautical art was abandoned, as compared with its flourishing condition in Holland and England," and offered to procure two eminent foreign masters to instruct the Venetian youths "in scientific navigation, and in the art of the Bombardier at sea." The offer was accepted, but nothing was done, the question of ways and means being an obstacle. In obedience to a decree of the Senate of 1710, the Proveditori, charged with the expenditures of the fleet, invoked the aid of the Venetian ambassadors at the Hague and in England in procuring capable masters, a suitable location for the school having been chosen. But this attempt was also a failure owing to the opposition of some senators who advocated the founding of a chair of nautical science in the state school—"Accademia dei Nobili"—which had been the principal seat of learning after the University of Padua. Finally, in 1739, a separate nautical school was established in Venice under the direction of Captain Giovanni Siron, whose official title was "Maestro Publico di Nautica Scientifica," whose studies in England, followed by practical

*Contarini Gasparo, De Magistratibus ac Republica Venetorum, Libri 5, Paris, 1543.—Translated into Italian and French.

experience during long voyages and subsequent services to the republic, fitted him admirably for the position. Only eighteen cadets, of not more than fourteen years of age, were admitted yearly, the sons of officers and sailors being preferred, according to the merits of the parents and the ability of the candidates to read, write and cipher. The course was two years of so-called scientific study at the school, and four years afterwards spent at sea in learning the practice of the nautical art; one cadet being allowed to each ship. Journals of the voyages were kept with great minuteness, covering a wide field of observation of magnetic variations, courses, distances, the entrances of harbors, their surroundings, depth of water, sandbars, rocks, with diagrams of the ports and landmarks for the guidance of ships. These journals were submitted to the master at the end of each voyage for examination, and many of them, accompanied with the reports of Captain Siron, are still preserved in the archives of Venice. The pay of a cadet at sea was five ducats per month for the first two years, and eight ducats per month, with an allowance of bread in each case, for the last two years of his term of probation at sea. Then, if he were judged competent, he became successively Pilotino (sub-pilot) and Piloto (pilot) with authority to navigate a ship, and when necessary to exercise the functions of captain.

It appears that this very modest institution, in the eleventh year of its existence (1750), was complained of by a certain Girolamo Maria Ralbi "for devoting too much time to abstract science in imitation of the English and French who are in more need of science by reason of their long voyages." This naval critic, the first perhaps of his class, recommended in the place of science, a closer study of the construction of ships and of the charts of the Adriatic and Mediterranean—"nostri mari"—as more suited to the needs of the Venetian mariner. But Captain Siron was allowed to pursue the even tenor of his way undisturbed. Later, we find that translations of foreign nautical works were made for the use of the school, and that an Englishman named Edgecomb was appointed "Maestro di Nautica," probably in succession to Siron, of whom no further mention is made. The school itself disappears from the records in 1764, leaving no clue to its further history. It is probable that in common with the "Accademia Nobile" and other institutions of Venice, the "Scuola della Nautica" shared the fatal languor of that period of decline, until the once

powerful republic was finally swept away in the whirlwind of French invasion. Certain it is, therefore, upon the authority of the documents already cited, that the first humble school of navigation in Venice was opened in 1739,[88] nearly two centuries after the date of Jal's supposed college; that it had but one teacher, and no text-books of Venetian origin, and that the professorship in the Accademia de Nobil was the only other source of nautical instruction within the limits of the Republic until the present century, when a naval college was founded under the foreign rule of France and Austria successively.

We are assured by Macaulay, in his History of England, that the naval and military arms of the public defence were not administered as distinct professions by any of the maritime powers until the latter part of the seventeenth century. In France and England officers and men of both arms had until then been promiscuously engaged in sea and land operations, and it must be confessed that some of the victories achieved by generals on the sea, and by admirals in the field, compare favorably with many of the later triumphs of officers trained exclusively for either service. Even in our colonial history we find an illustration, on a small scale, of this mixed service in the case of Colonel William Rhett who, while commanding the militia of Charleston, S. C., was appointed Vice-Admiral of the little fleet of six merchantmen which Governor Johnson had seized and armed with guns from the fortifications. With this hastily improvised force, Rhett captured a French ship loaded with troops, and bore down so boldly upon the French admiral's squadron, anchored in the lower harbor, that the latter hastily slipped anchors and put to sea. Within our own recollection are the noted instances of the Austrian cavalry officer Tegethoff, who afterwards, as Vice-Admiral, won the naval battle of Lissa, and of Lieutenant Carter of our navy, who in the Civil War of 1861-5, entered the army and fought his way to the command of the cavalry division of the 23rd Corps, with the brevet rank of major-general. We might cite also the case of the gallant naval Lieutenant William Nelson, who in the same war, was transferred, at his request, to the army, and by his success, on special perilous service in his own State, Kentucky, and in the field, obtained the rank of brigadier-general previous to his untimely

[88] A school of Naval Architecture was opened in 1775 in the arsenal of Venice.

death. More than ever do the present (1866) methods of training for both services, together with the similiarity in weapons and equipments, make an occasional interchange of professions possible, at least so far as naval officers are concerned. But in the olden time there was only one profession of arms until the long reign of Louis XIV, when the art of war ashore and afloat attained such development that it became necessary to draw a line of demarcation permanently between the two services. "Either the command of a regiment or the command of a ship of war," says Macaulay, "was now a matter sufficient to occupy a single mind." (History of England, Vol. I.)

The first of the belligerents of that period to perceive this important fact was Louis XIV of France, who, surfeited with victories on land, began in earnest to aspire to the mastery of the sea. Already in the previous reign, that wise prime minister Cardinal Richelieu, had taken the first step to create a naval spirit in France by organizing a small corps of naval officers recruited from the young nobles who followed the sea from choice.[89] With only two such officers assigned to each ship, the French force gained a victory over some Spanish men-of-war. This triumph so elated Richelieu that he caused to be emblazoned on the stern of the largest vessel of her day this significant motto "Florent Quoque, Lilia ponto," which lost none of its force in the English translation, "Even on the Main, our Gallic lilies triumph." To Richelieu and to France is also due the original idea of a universal first meridian, which was established in 1632 on the Island of Ferro by decree of Louis XIII, but this was subsequently abandoned to gratify the pride of Louis XIV, who resolved that Paris should be the prime meridian of the globe, as well as the center of art and science in Europe.

The change was ratified by the metric commission of 1793, and France still retains her prime meridian at Paris in despite of the recent effort of the international conference at Washington to establish a common prime meridian for the whole world. In fact, the French were so intoxicated with the success of their arms in the reign of the Grand Monarque that they believed themselves and their king invincible. This feeling was manifested in the

[89] As early as 1541, Lazare de Baëf, Minister of Francis I, of France, to the court of Venice, had published, at Basileae, an important work in quarto, on naval affairs as then understood, entitled "De re Navali."

direction of naval dominion by the inscription placed on the stern of the newly launched line-of-battle ship *St. Louis.*

"Je suis l'unique de l'onde
Et mon roy de monde.

which, says Schomberg,[90] was translated "with special reference to their neighbors across the Channel:"

"I on the Ocean am the mightiest thing,
As, on the land, is my all-potent King."

But it was Jean Baptiste Colbert, the finance minister of Louis XIV, who by his singular creative force and wise use of the almost arbitrary power vested in him, organized a distinct naval service long before the English thought of such a thing,[91] and made France a great naval power during his lifetime. He completed the separation between the naval and military services in France, dating from 1669, by rigorously excluding from the new marine men not bred to sea, and by supplying all vacancies from the merchant service, so that every fighting ship had its full complement of sea-officers. Moreover, he availed himself of the valuable services of such daring, self-taught seamen as Duquesne, Tourville and that famous "loup-de-mer" Jean Bart, and others of similar type, who, like some of our own revolutionary captains, began their career as legalized corsairs, empowered to make war upon any declared enemies of the nation. So rapid was thenceforward the advancement of the French navy in ships and nautical skill that even in 1676 it was able to fight the Spanish and Dutch fleets combined. It was the Dutch, however, who first became the masters of scientific naval construction. Their men-of-war were the models of the period, well worthy of being commanded by such officers as Van Tromp, De Ruyter and De Witt. The Dutch also published valuable works on shipbuilding, with engravings amply illustrating the art. These were gathered together in the Bibliothèque Nationale by order of Colbert, who also caused the various texts to be translated into French to the great benefit of the French marine.

[90] Naval Chronology, by Captain Isaac Schomberg, R. N., London, 1803.

[91] In fact the French led the way for many years in improvement in shipbuilding and ordnance, and in our time first organized an ironclad fleet with guns *en barbette*, although these ships were not constructed of iron. It was Colbert who projected the French Academy,—Institut de France—although the law creating it was not put into operation until 1795.

Indeed it became the custom to send ambitious young Frenchmen to Holland to study naval construction, which custom was continued even to the close of the last century. But this noble art, born in Holland, passed into France when she took the lead in the culture of nautical art and science. Of all Colbert's efforts to this end, and to the improvement of the French navy, nothing was more effective than the system of naval education inaugurated by his soverign, Louis XIV. In 1669, he founded a college at St. Malo, then a seaport of great importance, for the instruction "of officers, gunners, pilots, sailors and other persons needed for the maneuvering and piloting of ships." This was known as the "Collége de la Marine," the earliest nautical school established in France. In the same year a naval uniform was provided for officers of all grades, which tended to create a commendable esprit de corps, although the uniform was not generally worn until the First Empire. Already there was published at Paris one of the earliest of French nautical works by Père Georges Fournier, which although considered a singular admixture of fact and fiction, is nevertheless an interesting picture of the infancy of the French marine. Fournier was a skilful hydrographer, and made several voyages in that capacity, taking note of the best ships of war then afloat. Among these he gives the first place to the "Vaisseau de la Couronne" of the French Navy, which he thus apostrophizes as the wonder of her day.[92]

"O Superbe Vaisseau dont la poupe dorée
Peut eblouir nos yeux de son moindre ornement,
Ou vous estes l'effect de quelqu' enchantment,
Ou vous servez encor de palais à Nérée.
Est-ce un château mouvant? Est-ce une Citadelle?
Quelle étrange structure et pompeux bâtiment.
Vis-t-on jamais machine et plus riche et plus belle,
Surmonter les fureurs de l'humide élément?"

But what interests us particularly in the naval policy of Colbert, and what fostered greatly the rising naval spirit of France, was the formation of companies of "Gardes de Pavillon" and "Gardes de la Marine," to the latter of which was attached a junior class of "Aspirants de la Marine"—all sons of the nobility —who were to fill vacancies in the gardes. These youngsters, cor-

[92] Fournier, "L'Hydrographie, contenant la théorie et la pratique de toutes les parties de la Navigation," Paris, 1643.

responding to the midshipmen of the British navy, were required to have a yearly allowance of six hundred livres from their parents, and their uniform differed from that of the gardes in the absence of the well-known aiguillette and hat-band. The Gardes de Pavillon, as their title indicates, were the special body-guard of the Admiral, or Flag Officer, in port and ashore; but at sea they were required to do duty with the Gardes de la Marine in the regular watches. The companies of gardes were organized in the maritime ports of Brest, Toulon, and Rochefort, where schools were opened on shore for their instruction in seamanship, gunnery, mathematics, hydrography, drawing, naval construction, fencing and dancing. This event took place in 1672, from which date the policy of special education for the naval service of France has been continued amid all the mutations of dynasty and government to which that great nation has been subjected.

From the ranks of the gardes all vacancies in the lower commissioned grades of officers were supplied, and it is worthy of note that none but youths of gentle or noble birth were for a long period admitted into the corps. This requirement was strictly enforced as a means of placing the navy upon the same aristocratic footing as the army. At first, captains' commissions were given by the king only to officers of noble birth, upon the ground that they would be "more acceptable and formidable in their own country as well as abroad." But the rapid increase of the navy made is necessary to employ bourgeois captains on temporary service. Previous to the creation of a naval profession in France, whoever made arms his sole occupation, whether he was of noble birth or a commoner, was considered a gentleman. But afterwards the term received a new interpretation with the spread of education and civilization. It acquired a broader and deeper significance, arising from the character of the individual rather than from the accident of birth, and it is in this sense that the junior corps of the navy of every maritime state has been recruited from its young gentlemen.

The immediate effect of Colbert's policy was to awaken a spirit of investigation throughout the naval service, and among the savants of France. Problems in nautical science and art were frequently discussed in public, and opportunities were eagerly sought by officers of all grades for conference upon the condition and improvement of the newly organized marine. These efforts were

encouraged also by the successors of Colbert, one of whom, Rouille, was instrumental, in 1752, in founding the "Académie de Marine" as an experiment. This body, composed of officers and other persons interested in naval affairs, was recognized by the crown only so far as to obtain a sanction for its proceedings; but its labors were so successful that Louis XV resolved in 1756 to create a permanent national institution called the "Académie Royale de Marine," whose members labored unceasingly to connect the theory with the practice of the seaman's art. In fact they unfolded many of its mysteries in a series of text-books, from which later professional writers of all nations have derived valuable material and inspiration. In this connection, the labors of the Roman Catholic clergy of France, as writers and teachers, are deserving of special notice. Père Fournier, already mentioned, had the honor of leading the way for his countrymen in nautical investigation and dissertation. He was followed by Père Denys, perhaps the earliest teacher of navigation in France (1673), who instructed the pilots at Dieppe in that noble science which he quaintly described as advancing on two feet, latitude and longitude. Then came the great writers on this and cognate subjects, Hort, Hoste, Pézénas, Dechalles and others—all ecclesiastics. Indeed for nearly three centuries the study of celestial movements relating to navigation had been cultivated with great zeal by learned men of this class, and it was the chaplains of French ships of war who, until 1791, were exclusively charged with the duty of taking astronomical observations at sea, and instructing the "Aspirants" in the use of nautical instruments.

The "Académie des Sciences," founded in 1677, produced the earliest and best French writers in this field of investigation. Renaud, who had studied naval construction in the Dutch school, published his "Théorie des Vaisseaux" in 1689. The new method of designing ships of war upon mathematical principles was encouraged by Louis XIV, who charged Renaud with the instruction of apprentices in the art of ship-building in all the maritime ports of the kingdom.[80] He succeeded so well that some

[80] To the French is due the first introduction of port-holes in wooden ships of war, which made it practicable to carry in the larger ships two or three tiers of guns. Previously guns were pointed over the side-walls of the ship, commonly called gun-walls, from which the word gunwale is derived.

of his pupils, under twenty years of age, designed vessels of the largest class, and in despite of the ridicule of the Councillor of State, he built a bomb-vessel—a great novelty—armed with a heavy mortar, which enabled his royal master to bombard the capital of the Dey of Algiers.[94] Père Hort published his "Traité de l'Architecture Navale" in 1696. Paul Hoste, professor of mathematics in the Naval College at Toulon and founder of the science of naval tactics, published his "Traité des Evolutions Navales et de la Construction des Vaisseaux," in 1697, and his "L'art des Armées Navales" (translated into English by Christopher O'Bryen in 1762) while Picard, Richer, Cassini, La Caille, Clairault, d'Alembert, Jacques Bernouilli and others labored in the development of mathematics, astronomy and navigation.[95] Later on we find Jean Bernouilli who, in 1710, published his "Nouvelle Théorie de la Manœuvre des Vaisseaux," to refute some questionable principles advanced by Renaud upon the same subject; and Bouguer, who in 1727 and subsequent years, wrote the "Traité de la Mature, Traité de la Manœuvre des Vaisseaux," and "Nouveau Traité de la Navigation." He also invented a variation compass, and an improvement of the log. Following him, Pitot in 1731, published the "Théorie de la Manœuvre des Vaisseaux;" which was translated into English by Edmund Stone in 1743 and used as a text-book in the British navy; Père Pézénas, in 1733, the "Pratique du Pilotage;" Daniel Bernouilli, in 1738, the "Hydronamique," and several short treatises relative to the stability and movement of ships; while his rival, Euler, published, in 1749 the "Science Navale," and from his calculations there resulted a certainty in fixing the stability of ships never before

[94] Captain C. N. Robinson, R. N., writing on "A man-of-war of 1893," says that "an armored vessel was built in 1585 by a shipwright of Antwerp, during the wars with the Spaniards—a craft of great size with a flat bottom and sides covered with iron plates fastened into great beams of wood; it was a floating castle, impregnable to artillery of that day; there were sharp-shooters in the tops, protected with bulwarks; it was called 'Finis Belli,' to indicate the confidence of the builders in its power, but it proved a great failure; it grounded in a canal, where the Spaniards got possession of it, and was exhibited as one of the sights of the time. An engraving of it is given in the Graphic (English) of March 17, 1894."

[95] Other writers on navigation in the 17th century were Dechales, Dassien, Sauveur, and Blondel, St. Aubin in France, Crescenti and Riccioli in Italy, and Stevin and Willebordius Guelfeus in Holland.

attained. In the following years, between 1763 and 1789, appeared "Instructions Nautiques" by Fleurian; "Elements d'Architecture Navale," "Le Manœuvrier," by Bourdé de Villehuet (1769), "Traite de la Corderie," and "Etude sur les Bois," by Dugamel de Monceau, who expressed the opinon that the chief advantage of membership of the Académie des Sciences was "not to speak but of that which one knows;" also "Traité de l'Arrimage et de la Charpente des Vaisseaux," by Groignard; "Dictionnaire de la Marine," and "Traité du Gréement," by l'Escalier; "Tactique Navale" by Morogues (1780), "l'Art de Guerre en Mer" by De Grenier (1780), "Nouvelle Théorie de la Manoeuvre des Vaisseaux," and "Dictionnaire de Marine," by Saverien; "Traité de la Mature," by Forfait; and "Installation et l'Arrimage des Vaisseaux," and "Dictionnaire de Marine," by Missiessy. In 1781 the first effort in the construction of an experiment vessel to be propelled by steam, was made by a Frenchman, the Marquis de Jouffroy, but it had no result. The French were discouraged in this direction by the declaration of one of the Bernouillis, in a paper that gained the prize of the "Académie des Sciences" at Paris, in 1753, that "the steam engine, however improved, would never be advantageously applied to maritime purposes."* To this problem, not then of pressing importance, the scientific minds of France gave little or no attention, being absorbed in the discussion of other great questions of vital interest to the maritime world. The members of the Académie Royale de Marine were particularly active in this connection, their contributions in the form of monographs being so numerous that in one year (1773) they made a volume of five hundred closely printed pages. Indeed, this institution had in its service almost every vigorous scientific mind in France, together with a large and valuable collection of works on all the arts and sciences bearing upon naval affairs, and a museum of models and machines. It procured, moreover, the erection of an astronomical observatory, obtained control of the workshops in which compasses and sand-glasses had been imperfectly manufactured, and in 1772 commenced the publication in more comprehensive form of the "Connaissance des Temps et des mouvements Celestes." This wonderful collection of astronomical and

* Eight years after Geoffrey's failure, W. Symington succeeded in applying the power of steam to the propulsion of vessels (1789).

mathematical data was originally commenced by Picard in 1677, being published three or four years in advance, so that in time it was accepted by all the nations as the most complete navigator's guide in existence. In 1766, schools of gunnery for naval apprentices were opened at Brest, Toulon and Rochefort; in 1773 the Ecole Royale de Marine for the education of young officers was established at Havre, and in the following year practice-ships were employed for the benefit of the entire personnel of the navy. In the Ecole Royale, the requirements for admission were, at first, of the most elementary character; but they were gradually increased until finally the French fell into the fatal error of cramming their immature naval "Aspirants" with too much theoretical knowledge. Napoleon I attempted to remedy this evil in 1810 by closing the institution at Havre and establishing floating schools in the harbors of Brest and Toulon.* Under the restoration, 1816, the Duc d'Angoulême, Grand Admiral of France, actually founded a naval school in the inland town of Angoulême, far away from salt water. It was closed in 1830, by the force of public ridicule hurled against it, and the popular schools at Brest and Toulon were reopened. In those days naval aspirants at these schools, and at the school of hydrography at Rouen, usually sold their text-books after graduation, for reasons of economy, their pay being very small, but most of them retained some favorite navigation book, like Dulague's Leçons de Naviga-

*Auguste Jal, the well known naval archaeologist, so often quoted in these pages, entered the school at Brest in 1811, and his boyish wonder at the majesty and mystery of the grand old 74-gun schoolship, which was his home for several years, developed into a feeling of respect and fear that clung to him through 28 years of service in the navy. Coupled with these first impressions, was the reverence he had for his captain (Lucas) who commanded the "Rédoutable" at Trafalgar, from whose main-top was fired the shot that killed Nelson. Captain Lucas heartily welcomed Jal on joining the school-ship, and while explaining all its puzzling mysteries to the astonished youth, the latter inquired, "What was the great man-of-war in its beginning?" to which Lucas replied "nobody knows." This declaration is said to have inspired Jal, upon his retirement from the naval service of France in 1815, to enter upon a careful investigation of the subject, which resulted in the publication of his "Archéologie Navale" in 1839—2 vols. 8vo. and of his "Glossaire Nautique" in 1850—1 vol. quarto,—both of great value to the naval profession. Even on those not remote days professional works were not written in a few months, as they are to-day.

tion, a special edition of which was published by Dulague (1824), containing all that was required to enable them to pass the examination for promotion.

All these movements necessarily gave a great impetus to naval education in France, and it might be supposed that the French navy of Louis XV's reign would have sustained the brilliant reputation it had made as a fighting force when led by such self-taught seamen as Duquesne, Tourville, Jean Bart and Duguay-Trouin, against the fleets of Spain, Holland and England. But its own historians inform us that it suffered its most inglorious defeats during the very period of its most rapid advancement in scientific knowledge. A certain timidity characterized the naval policy and the naval commanders of France after the demise of Louis XIV, the admitted superiority of her ships in build and speed being used too often to keep them out of danger.

What inspiring opportunities for distinction the French had during the Seven Years War with England (1756-1763) for the dominion of this vast continent. But although better educated in the science of war than the English, the French were beaten "and every cockpit in His Majesty's fleet resounded with the song of victory." Even the expected descent upon the British coast of the First Consul's flotilla, safely anchored in the harbor of Boulogne, could not reanimate the naval force of France, which if we are to believe a song writer of the period, was impudently challenged by a British bomb-ketch to a fight outside:

"Come forth, if ye dare, or in mass or division,
For, weary with watching, we long for some sport,
And we'll show you a sample of British decision,
That perhaps will astonish the Consular Court."

And when the battles were won, and no enemy afloat remaining to be whipped, the seamen of the fleet summed up the story in vigorous chorus as follows:

"Come all ye brave Britons, let no one complain
Britannia, Britannia! once more rules the main:
With bumpers o'erflowing we'll jovially sing,
And tell the high deeds of the year "Fifty-nine."*

*Among the strange customs prevailing in the French naval service about 1757 were these,—that only one hammock was allowed to two men, who slept in it by turns, and that the bodies of deceased officers and sailors were kept in the hold until the ship returned to port. Many of the Toulon convicts who cleared out the holds of such ships died in consequence of the horrid stench which they had to breathe while engaged in this work.—Army and Navy Gazette, 1893.

Even in our day a popular writer of sea tales puts into the mouth of an English sailor, speaking of the French, this verdict, "A nation that prefers soup to beer can't be up to much when ye think of him as fighting by land, let alone water, which they never will know nothing about."

Du Bourg* and other French writers attribute this decline of the French navy, as a fighting force, to the incapacity of the ministers charged with its administration, to the growing laxity of discipline, and to a spirit of jealousy and insubordination among its commanding officers, which even the stern will of the first Napoleon was unable to check. Indeed, at the close of the wars succeeding the Revolution of 1789 hardly a vestige of the powerful navy created by Louis XIV and his minister, Colbert, remained afloat. Of course England, after the decisive victories of the Nile and Trafalgar, more proudly and defiantly than ever ruled the seas. This result to which her great maritime spirit and skill for more than two hundred years had been infallibly tending, was singularly foreshadowed by the veteran Admiral Monson, who, after the defeat of the Spanish Armada, thus defined the qualities of the English and Spanish ships and seamen: "God has endu'd England with a singular blessing above the Southern Countries, both with shipping and mariners, and, to speak the truth England lies more convenient for the breeding of seamen than Spain; for what makes skilful and expert mariners but dangerous and painful navigations, where the weather and the seas are boisterous and rough, the coasts perilous, and the tide forceable. All which our Country is subject to . . . . Then on the contrary with Spain, for betwixt them and their Indies, Guinea and Brazil, to which places their chiefest trade is, the seas are calm, and the weather fair, the coasts are not perilous, nor the Tides strong. . . . Where there is so great an ease in Navigation, it breeds idle and unable mariners." And, when comparing English and Spanish ships of his time, wishing to give Cæsar his due, he writes, "Here I enter into the comparison of men, for if it were in my choice, I rather desire a reasonable ship of the King of Spain's, manned with Englishmen, than a very good ship of Her Majesty's manned with Spaniards.. . . . I would rather be one of the ten of the Queen's to encounter with twenty of them, than one of the twenty to encounter with ten of Her

*Du Bourg,—"Essais sur la Marine de France de 1661 a 1789.")

Majesty's." So much reliance did the gallant Admiral place in the spirit and muscle of the British seamen, which prevailed alike against Spaniard or Frenchman. "England," says Professor Laughton, lecturer on naval history at the Royal Naval College, Greenwich, "never possessed, never required a Colbert, but made up for deficiencies by the bulldog tenacity of its sailor brood, and the appearance at critical moments of great commanders." Scarcely less frank was the testimony of the cynical philosopher, Voltaire, who, with a thorough knowledge of his countrymen, thus plausibly endeavored to explain the inferiority of the French at sea: "The natives of the south of Europe navigate smooth seas: those of the north are frozen up during the winter; but the English seas are navigated in long, dark stormy nights, when nothing but skill and incessant exertion can preserve a vessel. Hence arises a degree of confidence in their sailors, which is almost incredible. Added to this confidence, they have that which arises from constant successes. The English sailor is always on the lookout, not with the fear of an enemy before his eyes, but like a strong pirate, with the hope of gain, and when going into action with an equal or even a superior force, he calculates his profits as certainly as if the enemy were taken." This sort of piratical calculation was made with peculiar satisfaction by the British tars in the action of Admiral Howe's fleet against the French fleet under Admiral Villaret (1794), when their wives, on board of some of the English ships, fought at the guns, encouraging and assisting their husbands with most resolute valor. In vain did the French fight under the inspiring motto, "Victory or death," emblazoned on little silk flags nailed at every gun port, and under the stronger inspiration of flagons of brandy placed between the guns, and mixed with gunpowder by the most ferocious of the guns' crews. Nothing could resist the combined attack of Jack and his Poll battling together on that day for glory and prize money. They had, too, the inspiration of the sea anthem "Rule Britannia," which English officers and crews were accustomed to sing on going into action.

"The French navy," says Rear Admiral Luce, "deserved much praise for aiding to bring our Revolutionary War to a successful termination. De Grasse possessed much nautical skill and stratagem, and the French were then so successful in their tactics as to give rise to the belief that they had discovered some new system

which the English failed to discover." But the new system "consisted in the study of their profession in war," which is the best of schools for officers and seamen. The French marine had its victories over the English navy in the reign of Louis XIV, and it could boast of many skilful commanders in its early history. Some of these are mentioned by Professor Laughton as follows: "Jean de Viemie, a true knight and able officer, was the earliest French admiral of note. Duquesne was the best of the officers who commanded in its early years. Suffren was one of the most dangerous enemies that the English fleet ever met, and without exception the most illustrious officer that has ever held command in the French navy. Jean Bart, Duguay Trouin, Thurot, and Surcouf, were daring freebooters of unsavory character. Suffren and Rodney, the former in the East Indies, the latter in the West Indies, on the same day, April 12, 1781, executed the evolution of 'breaking the line,' which was to become the leading principle of naval engagements." Mr. Laughton might have also mentioned the names of D'Estaing, Richery and De Grasse, who also studied their profession in war, with not a little credit to themselves. But the boldness of attack, and the better seamen and gunners of the British ships, so frequently carried the day that the French were at last disheartened. Perhaps no officer of the French navy felt these disasters more accutely than the gallant Admiral Villeneuve who lost his ship at Trafalgar,[100] and afterwards died by his own hand from mortification of spirit. It is this unfortunate commander who is represented addressing his brother officers in the following lines of an English humorous poem:

> "So now, mes sages sirs! we must give up de notion,
> And let England peaceably govern de Ocean;
> As Old Neptune wont grant us de rule of de sea,
> He may give his d——d pitchfork to Nelson for me."

The writer of these lines, probably an officer of Nelson's fleet, was imbued with the generous feeling of the fighting sailor towards his fallen foe, but many of the non-combatant English poetasters of that period were far less considerate in their dia-

[100] A very spirited poem, entitled "The Battle of Trafalgar," was written on the very scene of the action, by Dr. Lawrence Halloran, Chaplain of the *Britannia*.

tribes, which gloated over the already much humbled and stricken enemy. Among these Peter Pindar[101] was conspicuous, venting his acerbity in the following harsh lines:

"Keel up lies France! long may she keep that posture,
Her knav'ry, folly, on the rocks have tossed her,
Behold the thousands that surround the wreck!
Her cables parted, her rudder gone,
Split all her sails, her mainmast down,
Chok'd all her pumps, broke in her deck,
Sport for the winds, the billows o'er her roll,
Now I am glad of it with all my soul."

[101] The nom-de-plume of Dr. John Wolcott.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE ALARMING CONDITION OF THE NAVY PERSONNEL—RESPONSIBILITY AND REMEDY.

By LIEUTENANT-COMMANDER A. L. KEY, U. S. Navy.

The Prize Essay for 1906 is an academic discussion of abstract principles. Undoubtedly a pro-selectionist, who confines himself to theories, with a good turn for argument and a liberal command of language can present a paper fully as convincing in favor of selection.

Instead of indulging in generalities, why not go straight at the root of the matter and deal with the concrete conditions that exist? Let us apply some of the essayist's absolute and general conclusions to the actual conditions existing in our Navy and decide whether the principles he enunciates are favorable to his side of the case or if they are clearly and unmistakably the most convincing arguments in favor of some form of selection.

The essayist says:—"But the man of the cabin, of the conning tower, and of the bridge, needs that familiarity with emergencies which experience, and *experience alone,* can give, and which steadies his judgment and gives him confidence." The words "experience alone" are italicized by the essayist. The "man of the cabin" evidently designates the admiral at sea; "of the conning tower," the captain of a battleship at sea; "of the bridge," the subordinate or watch officer at sea. The words "experience alone" are without doubt used in the sense of sea training alone. We all readily concede the absolute truth of the general principle here enunciated, therefore let us apply it to our Navy list as it stands to-day.

By reference to the Navy Register of January 1, 1906, it will be found that our five junior rear admirals average, in age, 61

years and 1 month (retire at 62), our five junior captains 56 years 8 months; our five junior commanders 48 years 4 months. These figures represent approximately the average conditions.

We find then the sea experience or sea training given to our officers in the three divisions named by the essayist is as follows: to the admiral less than a year, (many never get any); the captain 2 years; the commander 2 years, (since each captain and each commander makes only a cruise of 2 years); the subordinate officer, as shown by the average sea service of the five junior commanders, —17 years 3 months. That is to say "the man of the cabin," who occupies the supreme position of difficulty and responsibility, attains that position when he is 61 years of age, leaves it when he is 62, has only a drop of the one medicine necessary to make him efficient and receives his drop just as he is going on the retired list; "the man of the conning tower" gets his first dose, in the conning tower of a battleship, when he is 57 years old and he gets only a teaspoonful of the stuff that "steadies his judgment,—gives him confidence" and which *alone* will make him efficient; moreover he receives his small dose of conning tower medicine just as he is leaving the conning tower to occupy the cabin; "the man of the bridge," the subordinate officer, whose main function is to execute the captain's orders quickly and thoroughly, who must refer to the captain for decision all questions that arise out of unusual situations, gets a huge dose of the medicine necessary to make him prompt and skillful in obeying orders and *in looking to some one else to decide what shall be done in all emergencies.*

Therefore, when we apply the essayist's prescription to our personnel as it exists today, we find that we should have, as the general rule with its proverbial exceptions, very efficient subordinate officers, mediocre captains, and inefficient flag officers. Not because our officers in the grades of rear admiral and captain are not, in general, capable and intelligent officers, but because our flag officers are without sea training as flag officers and because our captains have very little sea training as captains.

Moreover the little experience received by our fleet commanders and captains of battleships does not come to the first named till they are more than 60 years of age, and to the last named till they are 57 years old. Long experience has established a proverb in our language, which is frequently applied to humanity, as well as canines,—"You cannot teach an old dog to perform new

tricks." To a certain extent an old man may be trained to perform new tricks but there is absolutely no question that he will master things new to him in much less time and much more thoroughly when he is under fifty years of age than when he is more than fifty. If a man is accustomed to *receive* orders till he is fifty, he will find it practically impossible to form the habit, after he has passed that age, to promptly accept responsibility in emergencies, take the initiative, and *instantly* give the directions that will best solve the problem presented. An efficient flag officer or captain must have these qualities. In other words under our system of promotion we cannot reasonably expect our flag officers and captains, because of the advanced age at which they reach the grade of commander, to even form the habit of command; and their experience is so limited that it is entirely impossible for them to skillfully maneuver squadrons or handle battleships with the efficiency that would be theirs had they more experience and training.

It may be said, however, since our Navy is maintained for the single purpose of fighting the Navy of some foreign power, when the necessity arises, that if our captains and flag officers have as much sea experience, or training, as the flag officers and captains of other navies, then we, at least, in the crucial test of war, will be on equal terms.

The following is the comparison tabulated from the latest information on file in the Office of Naval Intelligence showing the relative average "experience" in grades and the ages of the youngest and oldest of our flag officers and captains compared with those of England, France, Germany and Japan:

	SEA-GOING FLAG OFFICERS: REAR AND VICE ADMIRALS.		CAPTAINS:	
	Average years in grade.	Ages.	Average years in grade.	Ages.
Great Britain	8.0	49 to 62	11.2	35 to 55
France	14.2	53 to 64	9.5	47 to 59
Germany	6.0	51 to 56	6.2	42 to 52
Japan	11.0	44 to 57	8.0	38 to 52.0
United States	1.0	59 to 62	4.5	55 to 61.5

Particular attention is invited to this table as the conclusions reached in this paper are based upon the facts therein shown.

A comparison of the sea experience in these grades, if the information were at hand, would undoubtedly be much more to the disadvantage of our "man in the cabin" and our "man in the conning tower" than even the above comparison.

A distinguished officer of our Navy in a recent written discussion of the overwhelming and unparalleled victory of the Japanese in the battle of the Sea of Japan, in answer to the question "could a different result have been achieved?" states, in partial reply,—"No other one factor in such a contest is of as overshadowing importance as the skill, nerve, and endurance of the admiral." This must necessarily be true, the great naval wars of the present,—and of the future, so far as can be foretold by human intelligence,—will be decided by tremendous fleet actions of battleships. The battleships are the chessmen of the admiral. If a skilled chess player is pitted against an unskilled player there is no uncertainty about the result and, moreover, the game will be played in an exceedingly short space of time.

The following paragraph from the prize essayist is very misleading:—"It would be easy, but it is unnecessary, to quote from history long lists of instances where leaders over fifty years of age have won great victories. It is sufficient to recall the work of our Farragut, and of those who conducted the naval campaigns of the war with Spain."

There is no question about a man being able to do things *after* he is fifty provided his experience *before* he is fifty has fitted him to do them. Admiral Farragut commanded the schooner *Ferret*, in operations against pirates in West India waters, when he was 22 years of age. He commanded the *Boxer* and *Decatur* when he was from 32 to 37 years old, commanded the *Saratoga* at 46, in blockading operations during the war with Mexico, etc., etc.

Admiral Dewey was in command of the *Narragansett* at 32, was always in command after that, and had eleven years at sea, in command of different ships before he was promoted to flag rank.

Read Admiral Sampson commanded his first ship, the *Alert*, with the rank of commander, when he was 34 and was always in command thereafter.

Though none of these distinguished officers ever commanded a fleet of battleships in action against another fleet of battleships, the history of each is a profound and telling argument in favor of getting officers to command rank before they are 35, instead of at

50, as we do under our present system of promotion. Any patriotic and intelligent American who investigates the existing condition of the personnel of our navy cannot fail to be astounded and alarmed. He will naturally ask *who* is responsible? *Why* do we expend a hundred million a year to maintain an efficient navy and deliberately continue a system of promotion that plainly and necessarily gives us untrained admirals and poorly trained captains?

It is certainly not the fault of the officers of the navy. Admiral Converse, the Chief of the Bureau of Navigation, in his annual report to the present Secretary of the Navy, made last autumn, says, under the heading of "*Age and Rank*:"

"This subject was discussed at some length in my last annual report, and the views of the Bureau were fully indorsed by your predecessor. These were in general effect that officers arrived at flag and command ranks too late, and served too short a period in those grades for the general efficiency of the Navy. Rear Admiral Taylor summed the latter in the memorandum referred to above, viz:

"'AGES OF CAPTAINS—*Unless these be diminished, disaster is practically certain to ensue.* The memorandum here mentioned was written a few days before the death in July, 1904, of that justly distinguished officer when he was preparing his annual report as Chief of Bureau of Navigation.'"

The Secretary of the Navy (Mr. Moody) in his annual report, in 1903, under the heading of *age and command rank*, says:

"In discussing this subject, the Chief of Bureau suggests as the only remedy for the evils attending the tardy attainment of command rank—a defect inherent in other military and naval systems—early compulsory retirement in the higher grades."

It should be noted that our Navy is the only one that failed to long ago correct the fatal evil here mentioned.

The report of the Secretary of the Navy (Mr. Morton), in 1904, states, under the heading of *age and command rank*:

"The interests of the service are paramount in such a matter, and I believe that action should be taken to place younger men in positions of command as soon as a way can be found to do so that does not involve injustice or impose unnecessary hardship upon officers whose long and worthy service entitles them to consideration."

The present Secretary of the Navy in his annual report of 1905,

recognizes the necessity of getting officers to command rank at a less advanced age and suggests a tentative scheme to remedy the evil.

The plan outlined by the Secretary, of which he invites discussion, would result in making the number of officers in the various grades of the navy practically equal. The fact that it would soon give us more than a hundred admirals on the active list precludes it from serious consideration.

The President, in his annual message of 1904, says, under the heading of *The Navy*: *"Sooner or later we shall have to provide for some method by which there will be promotions for merit as well as for seniority, or else retirement of all those who after a certain age have not passed beyond a certain grade."*

The following statement is taken from the President's annual message of 1905:

"In both the army and navy there should be some principle of selection, that is of promotion for merit, and there should be a resolute effort to eliminate the aged officers of reputable character who possess no special efficiency."

The above quotations from official sources show conclusively that the fatal and acknowledged weakness in the personnel of our navy has been repeatedly and emphatically called to the attention of the Congress, the only power that possesses the authority to remedy the evil. Congress depends directly, and the people indirectly, upon the Senate and House Naval Committees to prepare all general legislation required for the welfare and efficiency of the navy.

In less time than two weeks either the Senate Naval Committee or the House Naval Committee could prepare a law, based upon the recommendations so frequently made by the executive officers of the government, that would justly and effectually end the present deplorable condition of our personnel; which, moreover, would not cost a dollar and which would add more to the efficiency of the navy than the building of a half dozen battleships, at a cost of fifty millions of dollars, to say nothing of the cost of their maintenance.

The question naturally arises, Why, with the facts and recommendations placed squarely before them, do the Senate and House Naval Committees remain inactive and, apparently, uninterested? Only the chairmen, or the members, of these two committees can properly reply to this question.

The problem before the two committees, to get our officers to command and flag ranks at less advanced ages and to keep them at sea long enough to permit them to become efficient, without harsh treatment of reputable officers who possess no special efficiency, does not present any material difficulties.

The principal features of the method inaugurated by the Personnel Act of 1899, which has been in operation for six years, have met with the general approval of the naval service. Partly through an unfortunate and unwarranted interpretation of that law by the Navy Department, which has been recently corrected by the Department of Justice, and partially because captains and commanders have not applied for voluntary retirement, under its provisions, to the extent that was anticipated, the law has not proved as effective as its framers hoped that it would. Under its provisions three captains, eighteen commanders and fifty-four lieutenant commanders have been placed, voluntarily, on the retired list and eight lieutenants have been placed on the retired list by selection. It is plain, since the one avowed object of the law is to get officers to command and flag rank at less advanced ages, the most effective grade in which to make the vacancies is in the grade of captain, as each captain retired brings every commander one number nearer to the command of a battleship, all junior officers one number nearer command rank, and also brings all captains junior to the one retired one number nearer flag rank. It is, therefore, evident that if the present law were so amended that it would result in making more vacancies in the captain's list it would work much more effectually in the accomplishment of the one object in view. It would also result in a very considerable financial saving on the retired list. It is evident that under any system of promotion the cost of the active list remains the same as long as the grades are kept filled to their authorized strength. Therefore to compare the cost of any two systems of promotion, if the numbers in the grades on the active list are unchanged, we need merely compare the costs of the retired lists they produce.

If we consider that officers retire in the several grades at the following ages, which approximate the average: captains 58, commanders 52, lieutenant commanders 46 and lieutenants 35, their actual payments on the retired list, under the Personnel Act, using

standard actuary tables for their "expectation of life," is as follows:

Captains	$60,375
Commanders	64,125
Lieutenant-Commanders	75,000
Lieutenants	83,475

Taking these figures as a basis, the 3 captains, 18 commanders, 54 lieutenant commanders and 8 lieutenants (83 officers in all) who have been retired, will cost the government $918,300 more than it would have cost had 50 captains and 33 commanders been retired instead, and the latter arrangement would have been tremendously more effective in the accomplishment of the one object in view.

To properly decide upon an economical system of promotion that will give the desired results we must first determine the proportional number of officers required in the several grades to furnish officers for our fleet and to perform the necessary shore duty, the ages at which officers should reach the various grades and the length of time they should serve in each grade, in order that our "man of the cabin, of the conning tower and of the bridge" may become thoroughly skillful and efficient.

By reference to the report of the Chief of Bureau of Navigation, for 1904, it will be found that approximately the proportional number of officers we require on the sea-going active list, below flag rank, is as follows: captains 7 per cent. (now 8.3 per cent.), commanders 7 per cent. (now 13.2 per cent.), lieutenant commanders 18 per cent. (now 23.6 per cent.), lieutenants 41 per cent. (now 35.2 per cent.), lieutenants junior grade and ensigns about 27 per cent. (now 19.6 per cent.)

It is believed that the following periods of service in grades will meet with the general approval of the officers of the navy as desirable and will compare favorably with the practice in other navies: in the grades of lieutenant junior grade and ensign, 6 years; lieutenant 11 years; lieutenant commander 7 years; commander 4 years; captain 7 years; flag officer 7 to 9 years. Should the age of entrance to the Naval Academy be reduced to not more than 17 nor less than 15, as soon as practicable without excluding candidates already selected, the average ages at which officers would serve in the various grades would be as follows: ensign and lieutenant junior grade from 20 to 26, lieutenant from 26

to 37, lieutenant commander from 37 to 44, commander from 44 to 48, captain from 48 to 55, flag officer from 55 to 62 (or to 64 if selected).

In order to accomplish the results here indicated, with the officers assigned to the various grades in the proportions given above and distributed in the several grades at their proper ages; would require each year, in addition to casualties and age retirements, 15 per cent. of vacancies in the captain's list and 7 per cent. in the lieutenant commander's list. As the navy list stands to-day, compared with the list above outlined, the officers in the grades of rear admiral, captain and commander are very much too old for their places, the lieutenant commander's list is nearly normal, while the officers in the grade of lieutenant are rather young for their places on the list. In order then to accomplish results within a reasonable time, it will be necessary to provide, temporarily, for the elimination of some of the old commanders and old flag officers.

In all of the principal navies, except our own, where officers of reputable character are removed from the sea-going list, in order to give the necessary flow of promotion, their services are utilized as far as possible.

Similarly there is no reason why the officers eliminated from our sea-going list should not perform a large proportion of the shore duty.

The following is a brief statement of the solution of the problem before us. Amend the Personnel Act in the following particulars:

Authorize that the sea-going active list of the line of the navy shall be composed of 24 *rear admirals* (*the number on the list January* 1, 1906,) *the number of officers below flag rank to be distributed among the several grades in the following proportions of the total number of commissioned officers below flag rank: captains* 7 *per cent., commanders* 7 *per cent., lieutenant commanders* 18 *per cent., lieutenants* 41 *per cent., lieutenants junior grade and ensigns* 27 *per cent., provided that the number of captains is not reduced below* 85, *nor the number of commanders below* 85, *and provide that no one shall be reduced in rank.*

Create a reserve list for shore duty only, except in war, upon which an officer can have but one promotion, after examination, contemporaneously with the officer next ahead of him on the sea-

going list, to be placed upon the retired list upon reaching the age of 62. Place upon it all flag officers now on the sea-going list over 60 years of age, who have not performed any sea duty as flag officers. Prior to July 1, '07, place upon it the day following his promotion to rear admiral any officer more than 60 years of age. After July 1, '07, place upon it, the day following his promotion to rear admiral, any officer more than 59 years of age. Have the board of five rear admirals provided by the Personnel Act, whenever on June 30 of each year the senior 10 captains average more than 55 years of age, designate 15 per cent. of the captains for the reserve list, similarly on June 30 of each year when the senior 10 commanders average more than 50 years of age, place 7 per cent. of the commanders on the reserve list. Similarly on the 30th of June when the senior 10 lieutenants average more than 37, a board of five captains, to be organized and governed by the same oath and form of procedure as the board of five rear admirals already mentioned, to select 7 per cent. of the lieutenant commanders for the reserve list. In computing these perecentages all resultant fractions to be excluded. Permit captains, commanders and lieutenant commanders to apply for the reserve list, their applications to be given such weight as the boards deem for the best interests of the service.

This would give the necessary flow of promotion, and as the commissioned personnel is increased by graduates from the Naval Academy they would be annually automatically distributed in proper proportions in the several grades without additional legislation. The reserve list would provide a large proportion of the officers for shore duty. The sea-going list would spend most of the time at sea, where they would get the only experience that has any value in a fleet action between battleships. It is an economical arrangement as officers on the reserve list are given only one promotion and retire at 62 in the grade which they then hold. While they are on the reserve list they earn their pay by the performance of necesssary work on shore.

Should this plan be put in operation the clause that applies to the elimination of captains would be effective nearly every year, with the result that 8 out of 16 officers promoted to the grade of captain would, before reaching the top of the captain's list, be eliminated from the sea-going list and placed on the reserve list. The clause applicable to the commanders would be effective for only about three years and would place about 15 commanders

on the reserve list. The clause applicable to the lieutenant commanders would not become effective for a few years, as the senior lieutenants now average only about 34; when it does become effective 8 out of every 32 officers promoted to the grade of lieutenant commander will be placed on the reserve list as lieutenant commanders.

Should these suggestions be enacted into law before next July, then by July 1, '09, it will have accomplished the results desired. Under this system of promotion officers serving in the grade of lieutenant commander and below would have the strongest incentive to efficiently perform their duties and to develop to the highest point possible their professional knowledge and skill, for they would be constantly confronted with the fact that one out of every four reaching the grade of lieutenant commander must be removed from the sea-going list; similarly a captain or commander would thoroughly realize that only the most skilful and efficient could hope to command a squadron as a rear admiral, for one out of every two officers reaching the captain's grade must be removed from the sea-going list before reaching the top of the grade.

There is one weak point in the plan of promotion here outlined. It offers no inducement, incentive or competition for a rear admiral, at the age of 55, to knuckle down to hard work and make a record for industry, skill and efficiency as a flag officer. Everybody knows that "Competition is the life of trade," in these days of high tariffs, trusts and monopolies the idea would probably be better conveyed if we say that "Fair competition is the life of trade." Fair competition in all professions brings the best results and this rule applies to the naval officer with precisely as much truth and force as it does to other men in other professions.

In all the principal navies of the world—except our own—the grade of vice admiral forms a part of the regular organization. Other nations have apparently created the grade, first, to give a strong inducement to rear admirals to be industrious and develop their skill and efficiency to the highest point in command of small squadrons and divisions in a fair competition for promotion to vice admiral: second, because the commander-in-chief of a fleet *or large squadron, with one or more rear admirals, under him,* with increased authority and responsibility, is logically entitled to

a higher rank than the flag officers serving under him; third, it gives a grade of selected flag officers, of high rank, each of experience, *proved* skill and efficiency as flag officers, competent and ready to obtain the best possible results with any fleet or squadron placed under his command.

We may be sure that England, France, Germany and Japan have not created the grade of vice admiral in their regular naval organizations merely as a matter of sentiment, but because they know that in a modern naval battle the factor of overshadowing importance is the skill, nerve and endurance of the admiral, and the grade of vice admiral is an important part of their machinery for obtaining the right men.

The following table gives the flag officers of our own and foreign navies:

	England.	France.	Germany.	Japan.	U. S.
Admirals of the Fleet....	4	—	1	—	1*
Admirals	11	—	4	7	—
Vice-admirals	23	15	8	23	—
Rear-admirals	49	30	19	25	18†

* Grade ceases to exist when vacated by present occupant.

† There are at present six rear-admirals, carried temporarily as extra numbers, on account of distinguished service during the war with Spain.

The following gives the relative proportions of flag officers to enlisted men, and also to tonnage built and building:

	England.	France.	Germany.	Japan.	U. S.
Tonnage per flag officer....	22,447	17,799	18,373	7,778	38,939
Men per flag officer.....	1,121	1,158	1,097	551	2,056

From the appearance of these tables one would naturally infer, that the American navy, compared with other navies, is without much honor in its own country. As a matter of fact we know that the people of our country cherish and honor the navy and are justly proud of the many bright pages in its history.

If the sentiment of the country could be ascertained it would be found to be strongly opposed to placing the senior officers of the American navy on a plane below that of all their foreign colleagues with whom they must frequently come in contact. There is nothing in their attitude that should lead our legislators to the conclusion that our people desire that the flag officers of the American navy when they meet foreign flag officers of similar

commands, should invariably give the first salute, unfailingly be seated at the foot of the table in all international naval conferences or operations and be assigned the foot of the line on all official occasions,—especially as this is done, as shown above, at pronounced expense to the efficiency of our navy.

In view of the facts above presented the scheme of promotion already outlined would require, to perfect it, a provision of the following general nature:

Authorize the President, with the advice and consent of the Senate, to designate six officers from the list of rear admirals, to remain on the active list till they reach the age of 64 with the rank of vice admiral, and thereafter whenever there is a vacancy among the vice admirals the President to appoint a board of three vice admirals, who shall be governed by the same oath and form of procedure as the board of five rear admirals authorized by the Personnel Act, to select from the rear admirals a flag officer to fill the vacancy, who shall have had not less than one year in command of a division, squadron, or fleet.

It may be thought that the plan of promotion here proposed would call for a considerable increase in appropriations but as a matter of fact it would really decrease expenses during the next thirteen years, provided the total number of officers on the active list is not increased. During the next thirteen years practically all of the officers now filling the grades of rear admiral, captain and commander will be retired for age, about 220 in all. Under our present laws nearly all will retire as rear admirals. Allowing for casualties a rough calculation shows that during the next thirteen years, under existing laws, we will retire 150 senior rear admirals and 40 junior rear admirals. Under the proposed plan, including a grade of six vice admirals, with a reserve list for shore duty formed by elimination from the sea-going list in order to make a proper flow of promotion, allowing an average of five years service in the grade of vice admiral, during the next thirteen years there would be retired 15 vice admirals, 75 senior rear admirals, 85 junior rear admirals, and 15 captains. Their cost on the retired list compared with the cost of the retirement of 150 senior rear admirals and 40 junior rear admirals, under the present system, using standard actuary tables for expectation of life, shows a saving on the retired list under the proposed system of $1,711,250.

The pay on the active list of six vice admirals would be $66,000 per annum which in 13 years would amount to $858,000. Therefore including the grade of six vice admirals on the active list a saving of $853,250 is shown in favor of the proposed system.

Moreover it must be remembered that under the proposed system the captains are *reduced*, on the sea-going list, from 8.2 per cent. to 7 per cent., the commanders from 13.2 per cent. to 7 per cent., the lieutenant commanders from 23.6 per cent. to 18 per cent., the lieutenants are *increased* from 35.1 per cent. to 41 per cent., the lieutenants junior grade and ensigns from 19.6 per cent. to 27 per cent., which means that 5.6 per cent. of the *total* number of officers below flag rank who now receive the pay of lieutenant commander would, on the new sea-going list, receive the pay of lieutenants, and 7.4 per cent. of the *total* number of officers below flag rank, who now receive the pay of captains and commanders would, under the proposed system, receive the pay of junior lieutenants and ensigns. This difference in the pay of the sea-going list will practically off-set the cost of the proposed reserve list and when the saving on the retired list is included, the proposed plan actually reduces the expenses of the government during the next thirteen years.

Could this proposed amendment to the Personnel Act be enacted into law before next July, then on July 1st, '09, as nearly as can be calculated, T. B. Howard would be the senior captain, E. A. Anderson the senior commander, J. B. Patton the senior lieutenant commander, and J. K. Taussig, the junior lieutenant commander.

This paper will have failed in its purpose if the facts presented do not convince the reader—be he expert or layman—that Rear Admiral Taylor, in one of the last official utterances of his life, when preparing his annual report as Chief of our Office of Personnel, did not in the least exaggerate our deplorable condition in saying that we "*invite* disaster." Since the admiral wrote this deliberate and well considered opinion there has been fought the greatest naval war that the world has ever seen, in which the material weapons furnished the officers of each navy were practically equal, and which speedily resulted, less than a year ago, in almost the total annihilation of the navy with a badly organized, poorly trained personnel; the victorious navy, with a personnel well organized,

thoroughly trained and prepared, really added to its material strength during the course of the war by its captures from the enemy. The lesson before us is so plain that he who runs may read. Again the question is naturally put by any patriotic and intelligent American, *why* does our government expend a hundred millions a year of the people's money for the purpose of maintaining an *efficient* navy, and, at the same time, fails to correct a condition in our personnel that is daily becoming more deplorable and dangerous and which can be easily remedied without the expenditure of a dollar, and which has been repeatedly and emphatically pointed out by the President and various Secretaries and high officials of the Navy Department?

It has been clearly shown that the legislative branch of the government must alone accept the responsibility for inaction and that the chairmen or members of the Senate and House Naval Committees may only properly reply to the above question.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

A LETTER OF EXPLANATION.

FEBRUARY 6, 1906.

DEAR SIR:—Since the appearance of my paper on Amalgamation in the last PROCEEDINGS OF THE INSTITUTE entitled "Is Amalgamation a Failure?" I have received several letters from different people who have evidently understood from reading my paper that I intended therein to criticise the officers of the U. S. S. *Bennington*, especially Commander Young and Ensign Wade. I regret that any such construction could have been put upon any language used by me, for nothing was further from my thoughts while writing.

The *Bennington* disaster had been seized upon by the opponents of amalgamation to prove that our present system is wrong, and in view of that fact it seemed necessary for me to touch upon the subject myself, although I would have preferred to avoid that topic altogether. Feeling that it was necessary to meet the opposition on this point, as well as on all others, I reluctantly took up that phase of the question, with the sole view of attempting to show that the present system of engineering organization in our navy and the accident to the *Bennington* were not related to each other as to cause and effect in the slightest degree. This I made it my endeavor to do without the utterance of the criticism of the ability or actions of any of the officers concerned.

I had available, at the time I wrote the paper, only the report of the Court of Inquiry, the findings of the Court Martial not having been made public at that date. I therefore most certainly did not intend to anticipate the findings of the Court by any such criticism; in fact I was awaiting the findings of the Court before making up my mind in regard to the matter.

I therefore regret that my language was such that it has been possible to construe it as a reflection upon Commander Young

or Ensign Wade (from neither of whom have I heard in regard to the matter), and I trust that this letter will be sufficient to remove any misapprehension existing in any quarter in regard to what my meaning and intention actually were.

I have to request that you will publish this letter in a prominent position in the next copy of the PROCEEDINGS OF THE NAVAL INSTITUTE, in order that I may as far as possible right any unintentional injustice that I may have done either of the officers mentioned, as well as place myself more distinctly in the position on the matter from which I tried never to depart.

Very respectfully,

L. H. CHANDLER,
Lieutenant-Commander, U. S. Navy.

THE SECRETARY AND TREASURER,
U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

DISCUSSION

Is Amalgamation a Failure?

(SEE No. 116.)

Commander W. F. WORTHINGTON, U. S. Navy.—The essayist has expressed his views in a very clear and forcible manner, and I wish to go on record as endorsing them strongly. I consider that his proposed modifications of the present amalgamation features of the Personnel Bill would be a distinct improvement, and the only changes which should be made to give an entirely satisfactory working organization, much better than we have ever had before, and better adapted to the needs of our navy than any system in use abroad. I go with him even to the length of amalgamating the Pay Corps, so thoroughly do I believe in a homogeneous organization on shipboard, and that "a house divided against itself cannot stand."

I wish particularly to support his "claim that the average graduate of the Naval Academy to-day is far better fitted to be a chief engineer's assistant than is the average man who secures an assistant engineer's license in the merchant service." I have come in contact with a number of these latter, as well as the former, and am confident that the essayist is correct. I appreciate the touch of humor which he has introduced into his essay by inserting in the Appendix "H" the kindergarten examination questions which are asked of the applicant for license for Chief Engineer of U. S. Ocean-going Steamers of Unlimited Tonnage, and quoting the wise provisions of the Revised Statutes, Section 4441, which reads "No original license shall be granted any engineer or assistant engineer who cannot read and write, and does not understand the plain rules of arithmetic."

An incidental advantage of drawing off from the body of the lieutenant-commanders of the navy a few officers to become specialists in engineering, ordnance, electricity, and in the pay department, would be to accelerate the promotion of young officers, without retiring able-bodied men in the higher grades. Also by furnishing an outlet for those who prefer to specialize, the body of officers of command rank would be composed almost exclusively of men who preferred a sea life and its kind of duties, authority and honors, to the more retired but equally busy life of technical men on shore.

Referring to the *Bennington*, I don't consider that an isolated case can prove anything either for or against a system, but since there are some contributors to the press who believe that disaster is an argument against the amalgamation feature, I wish to call their attention to the boiler explosion on the English battleship *Thunderer*, referred to by the late Chief Engineer King, U. S. Navy, in his "Warships and Navies of the World," as follows: "On July 14, 1876, during the first steam trials, an awful catas-

trophe occurred, occasioned by the explosion of the fore starboard boiler, which produced results more terrible than any accident on board a ship of war, from the effects of steam, hitherto recorded."

The explosion was attributed to the safety valve being stuck in place and the steam gauge being out of order. At that date amalgamation had not been heard of.

I agree with the essayist that amalgamation has not beeen proved a failure, for it has not been fairly tried. During the first few years it seemed at times as if those in authority wished to prove it a failure by omitting to take any measures to ensure the training of the younger line officers. The younger engineers were promptly ordered to the compass office, ordnance duty, and to watch duty on deck, at sea, but no corresponding system was adopted for the line officers. If put on duty at all, in the engine room, it was for short and irregular periods, and nothing prescribed as to their manner of doing duty, or the instruction they were to get.

My reasons for believing that amalgamation would succeeed, if tried, are as follows:

(1) On a tour of duty as instructor in the Department of Steam Engineering, at the Naval Academy, 1893-1895, I observed that the cadets who showed most aptitude for theoretical and practical engineering, did not go into the engineer corps. When an attempt was proposed to be made to force every tenth man, beginning at the top of the class, to go into the engineer corps, so as to have the talent distributed, the cadets made a violent and successful protest. The unpopularity of the engineer corps had begun before that time, and continued after, so that among the younger officers of the navy there has been, for a number of years prior to the passage of the Personnel Bill, more natural engineering talent in the line than in the lower grades of the engineer corps.

(2) During a tour of duty, from 1901 to 1904, as Fleet Engineer of the South Atlantic, European and North Atlantic Fleet, I came in close contact with engineer officers doing line duty on deck, and with line officers doing engineering duty below, and got to know from them the nature of their work sufficiently to convince me that it is not too much to expect one man to do both kinds of duty well.

(3) All of the young line officers who were ordered to my department, were zealous and attentive to their duty, and would have succeeded if allowed reasonable time. Several showed a marked aptitude. Many other young line officers expressed to me an interest in engineering work, and desire to learn, so that I am satisfied there will never be a lack of volunteers, providing the present system of advancing officers according to their seniority at graduation, regardless of the kind of duty they do, is continued.

(4) Previous to the passage of the Personnel Bill line officers, by their unaided efforts, attained distinction as designers of gun and electrical mechanism, while continuing to perform the routine duties of the line. From my own observation, I consider it is not a fact that the line officers' duties on deck are of such difficult nature that he must spend the whole, or even half of every cruise, on them alone, to be able to master them. He can spend half of his time in the engine room, and that would suffice

for him to learn all that it is necesary for him to know. Out of the sum total there would be no difficulty in getting the few of exceptional talent, who could become designers. Having had eight years' experience teaching at the Naval Academy and two colleges, I have found in every class of boys, always a few who could learn two or three times as much of any subject, in a given time, as the others.

In answer to charges that have been made, from time to time, in the public press, that our naval machinery is being damaged by the attempt to train young line officers as engineers, I can say that on the ships in the South Atlantic, European and North Atlantic squadrons, during my tour of duty, 1901-1904, the engineer departments were all in far better condition, and their organizations worked much more smoothly and harmoniously, and more free from break-downs, than was the case in the "White Squadron," in which I served from 1888 to 1891.

I think all officers who were in the navy in those days will remember that courts-martial, reprimands and suspensions from duty of engineer officers were quite common, while now they are very rare.

I would like also to call attention to the engine-room mishaps that are reported from time to time, in all the foreign navies, and to the circular letter on the subject just issued by the British Admiralty, as reported in the Army and Navy Gazette, December 2, 1905, where the amalgamation feature of their organization has not yet begun to work.

Many opponents of amalgamation ignore the fact that half of the engineer's duty on shipboard is of an administrative character, and consequently the young deck officer is just as likely as the young engineer to have this qualification. The greater part of the young officer's duty is to get routine work done. The education and training he gets at the Naval Academy fits him for this. The naval regulations, and the instructions in the log book, are a constant reminder of the details of his work which require special attention. Only in cases of exceptional casualties must he call for the assistance of the chief engineer, and this one man must have the exceptional knowledge which comes of experience.

Given the intellectual ability, and special training which all graduates must have, he can get the necessary experience in a comparatively few years, if his shore duty, as well as his sea service, are properly directed.

The question then narrows down to how much experience is necessary to qualify a graduate for the position of chief engineer. Looking back over the period of 25 years, preceding the passage of the Personnel Bill, we see that the first chief engineers of all the new navy, including battleships, got most of their previous sea experience in little wooden sailing vessels, with auxiliary steam power, and that they had spent half or more of their service on shore duty, and a large part of their sea service at anchor in port under sail at sea.

The most recent group of chief engineers, nearly all graduates of the naval academy, had served a large part of their time at sea, on the same class of old-fashioned ships, which used to lie in port months at a time to save coal. They were kept for years in subordinate positions, not because they needed the experience, but only because there were no higher places

for them. There were so many of these assistants on each ship that there was not work enough to go around. Many of them, to occupy time, took to the study of history, modern languages, painting, writing for magazines and newspapers, writing plays, stamp collecting, &c., &c., besides devoting extended periods of leave from their ships, to travel. Assuming that these officers have 15 years sea service credited to them, on the navy register, I think it would be fair to say that five years devoted exclusively to engineering duty, on modern war ships, would have rendered them just as well qualified as chief engineers, although naturally they would have got less culture. As for their shore duty, most of it had no direct bearing on ship work, and on returning to sea they would, in these days, feel that they had forgotten much of what was learned on the previous cruise.

I agree with the essayist that to abandon the amalgamation feature would be to take a step backward, which would soon have to be retraced, and I am strongly opposed to any such vacillating policy.

Commander JOHN K. BARTON.—From an inspection of papers submitted to midshipmen for examination and the curriculum in engineering given in the appendix, I think it is apparent that the undergraduate course of instruction in naval engineering at the naval academy is at least equal to that obtained in any institution, and with an opportunity for the necessary practice and experience after graduation, the naval academy graduate is fully equipped to become a proficient practical engineer.

It is with this latter condition that I think the main difficulty lies in the Personnel Law. The facilities after graduation and through the junior grades up to lieutenant-commander are not sufficient, and the lapses of time between successive assignments to engineeering duty are so great as to prevent an officer from obtaining that complete and necessary familiarity with the engineer department, its personnel, the skill, traits and character of the men of the various trades he is to efficiently command, and at the same time be a personal judge of the fitness of their technical work. Moreover, naval engineering is now so extended and complex that an officer after graduation is required to be a keen student of its many needs and rapid advances, which cannot be acquired without considerably more opportunities than at present enjoyed by the average line officer. This technical skill on the part of the head of department is essential, for its absence can only produce habits of laxity and indifference among the enlisted force of the engineer's division when the fact becomes known.

While the naval academy training may be excellent, it is only the ground work, the same as in the case of any professional course in a university. No matter how erudite the midshipmen may be or how much instruction they may receive from models, experimental engines, laboratory appliances or even the drill vessels attached to the academy, they cannot become competent to direct important repairs or reconstruction work until some regular system is adopted, whereby the young officer will serve through a graduated course for a fixed period of time in a subordinate capacity in the engineer department, and while in that capacity to be a part of, and belong to the organization of the engineer division.

Nor should engineering duty for midshipmen afloat be observation duty. I think it is largely a waste of valuable time, but rather they be given some actual responsible duty. It is as reasonable to expect them to reach athletic form by attendance and watching a tournament, as to become engineers by acting as spectators of the varied work in progress throughout the engineer department.

Another item entering largely into the success or non-success of the Personnel Law is the limited opportunity given to the younger line officers for instruction in general overhauling and repair. After having sufficient service afloat, our navy yards furnish exceptional advantages not only for instruction in such duty, but would enable more direct supervision to be given to the general work of repair on the ships assembled at the different navy yards for general overhauling operations.

I believe thoroughly with the author, that the Personnel Law never contemplated that a young ensign or midshipman, without some such training mentioned above, would be placed in full charge of an important department, and one further removed from the commanding officer than either the executive or navigating officer.

I would further suggest as an aid in the assignment of officers in charge of the engineering department of a ship, that the "Fitness Reports" of all junior officers be supplied with another interrogative paragraph as to the fitness of the officer for engineering duty, and what opportunities he has had of familiarizing himself with that duty.

I am in accord with the author in his remarks relating to designing engineers and his proposed method of selection, with the exception that I disagree with him as to the time of selection. The time of entry into the lieutenant-commander's list is, in my opinion, too late, and I would suggest that officers so designated should be selected on commission as lieutenants. Certainly with a proper enforcement of the Personnel Law he will have had sufficient experience to make a selection and his habits of life may certainly be said to have been formed at the age he has now reached.

In conclusion and in answer to the essayist's question "Is Amalgamation a Failure?" it would be rash to answer definitely until the working of the Personnel Law has been improved by a more earnest attempt to carry out its evident intent.

Lieutenant-Commander JOHN L. GOW, U. S. Navy.—I have always been an advocate of the education of all officers in engineering—that is in amalgamation.

Where the law has been carried out it has been unquestionably successful. The officers of the old engineer corps who, on the passage of the Personnel Bill, were given two years to "qualify" and then required to pass an examination or lose their commissions, are all now excellent deck officers. None of them failed to pass on their qualifying examination, and, I have been informed that they all passed creditably. They are now the peers of their classmates in all subjects pertaining to deck duties.

Had their classmates of the line been required to "qualify" and pass an examination in engineering, or lose their commissions, the question whether

amalgamation is a failure would not now arise. They, unquestionably, would have been equally successful, with the knowledge of engineering they already possessed, in passing "qualifying" examinations. Many young officers have so qualified for engineering duties, and have performed the duties creditably, but it has been voluntary on their part.

Enforce the law, and, as far as the sea-going officer is concerned, we will have a class of officers who thoroughly know their business.

As for the necessary designing and inspecting work on shore, for the Bureau of Ordnance, Equipment, and Steam Engineering, the proposed legislation of making specialists, extra numbers, would, I think, answer the purpose.

Lieutenant-Commander T. W. KINKAID, U. S. Navy.—I have read Lieutenant-Commander Chandler's article with the deepest interest, and there is little left for me to say beyond the single statement that I am entirely in accord with him. His plan for providing adequate training of officers, and for securing specialists in design is in my opinion entirely practicable; and it is bound to give results much superior to those that can reasonably be expected from any plan that proposes to bring in civilians that are wholly out of touch with naval life.

As suggested by the author, much can be done towards improving the all around efficiency of the younger line officer without any legislation whatever. While waiting for congress to give the desired relief, the navy department might, for example

(a) Extend the period of academic instruction to four and a half years, so as to obtain the time necessary for better training in machine design and laboratory work.

(b) Detail a few officers of the grade of ensign or lieutenant for a two year course of instruction in machine design and experimental engineering at some prominent technical school, such as Sibley College, Cornell University, or the Massachusetts Institute of Technology. Here they would have a chance to rub up against other post-graduate students, usually very bright men.

(c) Put out of commission enough of the less important ships to provide the officers and men needed on the remaining ships and on some of the shore stations. This would enable the work in all departments of ships and shore stations to be thoroughly done, and the older officers might then find time to take part in the instruction of the younger ones.

Commander B. A. FISKE.—An open-minded reflection over Lieutenant-Commander Chandler's paper will probably convince most officers that he has proved that it is impossible to educate line officers in such a way that they can perform all of the duties of line officers and engineers. There may be some difference of opinion as to the age at which officers should begin to specialize; but this must be considered a matter of detail, and as not affecting the main point.

The following additional considerations suggest themselves:

(1) Mr. Chandler has proved that naval academy graduates can become both good engineers and good line officers.

(2) We need, in charge of the engines, men of a very high grade of intelligence, education, and character.

(3) While it is true that we can get such men from the various technical schools of the country, it is sure that we would have to give them commissions; because the opportunities, throughout this prosperous country, for graduates of those schools are so excellent, that the kind of men we want would not come into the navy, unless they got commissions.

(4) If those men got commissions, they would live in the wardroom, they would be the equals in intelligence and refinement of the line officers, and there would be the same bickerings that we had in the days of the old engineer corps, and which amalgamation abolished. Furthermore, if they had uniforms, they would stand before the country as officers, just as much as anybody else; and their manner of wearing the uniform, their more or less military carriage, their amenability to discipline, and their devotion to the service, would affect the navy just as much as would those of line officers. Now, the navy's long and definite experience has proved that proper wearing of the uniform, military carriage, amenability to discipline, and devotion to the service, can best be secured by early training at the Naval Academy.

Rear Admiral G. W. BAIRD (formerly Chief Engineer) U. S. Navy.—Referring to the paper of Lieutenant-Commander Chandler on the subject of the amalgamation of the line with the engineer branch of the navy, though I very much fear there is nothing that I can say which will help matters, yet I should feel remiss should I sanction, by my silence, the confirmation of the very grave mistake of that amalgamation.

It is true that "the laws of congress forbid a passenger steamship to move 100 feet from the wharf, under steam, except she has at least one licensed engineer on board." This law dates back to about 1848, and was brought about by the frequent explosions of marine boilers, managed by unskillful engineers.

Blackstone, the father of English-speaking lawyers, once said that, to understand the real meaning of a law, it would be necessary to go back and ascertain the causes which led to the enactment of that law.

The boiler explosions, particularly on our western rivers, were not only disastrous at that time (1840 to 1848) but were not infrequent. At that time railroads were few; steamboats and stage coaches were the principal public vehicles.

From the time steam was placed in a boat, for motive power, contention between the deck force and the engine-room force began. It was peculiar to no particular nation, to no one line of steamers, to no particular navy, but it was general. It is the inevitable.

In the mercantile marine of all nations the problem was solved by a permanent and complete divorce between the deck and the engine-room forces, and this plan was tentatively followed in the U. S. navy until about 1869.

The first steamship used in the navy was the *Demologos* (afterwards *Fulton I.*), built in 1814, and blown up by her magazine at the New York

navy yard in 1839. Her engineers were employed by the month, and were selected from among the engine builders. Indeed, these were absolutely the only available men. Their presence on board ship, for cogent reasons, was not acceptable.

It was not believed that the new motive power had come to stay. The romance of the man-of-war's man's life was disturbed. The sails would be smutted by the smoke and the decks would be soiled. The glories of yard-arm to yard-arm battles would not be possible, and that chivalry and cleanliness inherent in the men-of-war would be molested. The space taken up in the ship's hold, for machinery and fuel, was certainly an aggravation. It is easy to understand this antipathy which was excited against the innovation. By a slow progress low-powered and auxiliary steamers were built, and used, but sailing ships were still being built in 1861 when the civil war began. We then had 53 sailing ships and 38 auxiliary powered steamers afloat, a total of 91 vessels with which to engage in a gigantic war.

The first engineer-in-chief of the navy was a Mr. Thomson; he was appointed not that he was an engineer, but because he had rendered important diplomatic services abroad, and was out of a job. The office of engineer-in-chief was created for him. When the *Mississippi* was completed this engineer-in-chief ordered her smoke-pipes to be changed, so as to debouch the products of combustion into the paddle boxes, "to induce a rapid draft," and he caused the chief engineer (Mr. Haswell) to be placed under arrest for objecting to his silly invention.

Mr. Copeland, who had been employed to design machinery, and was commissioned as "principal engineer," succeeded Mr. Thomson, but, the salary not being sufficient, resigned and returned to his private practice in New York. He was succeeded by Mr. Haswell. It was found that the best engineers could not be retained in the navy because of the better salaries or "wages" offered outside; engineers were scarce, and the demand for experienced men was great. It was then determined to establish an engineer corps, and it was done fairly by acclamation. In 1842 Mr. Haswell formulated the scheme for the corps, which was accepted with éclat, and congress enacted the law soon after the naval committee reported the bill. This was the result of experience.

A few candidates were admitted as chief engineers; a few as first-assistants, but all others as third-assistant engineers, after competitive examination. All of these men were required to have had experience as engine builders; those who had been graduated as civil engineers had to go into the shops and work before a permit for examination would be granted them. The department, in its wisdom and experience, was determined to secure the best talent the country afforded; to create emulation; to bring up a corps of engineers who would be part and parcel of the navy. At that time there were no schools and but scant literature for mechanical engineers; to-day there are more than 100 colleges teaching the art, and the literature on the subject is bountiful.

It should be regarded as an axiom that it should be the purpose of the navy to get the best talent the country affords, in all its branches; it should

be regarded as imperative that every officer should have practical experience in every detail of the business he has to execute on board ship.

An officer is but a leader of the men he commands; it is essential that he should have rank, and that he should live apart from the men he commands. A military man's importance is measured by the number of men he commands. It therefore seems reasonable that the man who stands watch in the engine-room and commands a watch of fifty firemen should have sufficient rank to enable him to enforce his orders.

The old engineer corps sought to *combine* the engineer and the officer; the amalgamated scheme separates them; it places one officer in command of the division, and provides for the enlistment of the watch engineers. The writer feels very well satisfied that the provisions of the act of congress which amalgamated the two corps is being carried out as was intended by its progenitors, and is also satisfied it is working a great harm to the naval service. The enormous cost of repairs to the machinery is evidence; the dissatisfaction of the men in the engineer division; the number of accidents, and the loss of interest in seamanship, are all evidences.

It is manifestly unfair to expect an amalgamated engineer, past forty years of age, to become a good deck watch officer, navigator or executive officer of a ship of war. There are many things which present themselves for his action which are not found in books; which must come to a man from intuition, or must be acquired by experience at an early age. The "pilot's eye," for example, is all important to a deck officer: the limited amount of mathematics essential to do navigating is easily learned and applied, but the appearance of the land fall is not in mathematics nor in applied mechanics.

Seamanship used to be regarded as the highest art of a seaman. An officer who was not a good seaman was not held in high esteem by his brother officers no matter what might be his other accomplishments. Seamanship is not a thing entirely of the past: ships of war will take prizes which are sailing ships: the rapid increase in the consumption of coal will, in a few years, make its price so great that it will be found economy to carry freights by sail.

A good seaman, as reckoned in the old navy, was essentially a good judge of the weather. Such is not the rule to-day. The battleship, with its twin screws, turned by high powered engines, is not so much affected by the weather, and, therefore, the same attention is not paid to the elements. In the meantime the seaman is becoming rusty. The amalgamated officer of to-day must "qualify" in so many sciences, arts, professions and trades that he is not likely to be a specialist in any. While everyone else is specializing, the United States navy alone is generalizing. No school nor college ever gave a man a profession; it can do no more than give him the foundation on which to build his profession. Occasionally the Good Lord creates a man of such aptitude and such excellent memory that he may become proficient in more than one profession or trade, but such men are rare.

The number of engineers on board our ships has been decreased out of proportion, from time to time, notwithstanding the repeated urgent appeals of the engineers-in-chief, the highest engineering authority in the navy.

These reports have been wonderfully similar, in this respect, ever since the end of the civil war. All the experiments to diminish the number of engineers have been patiently and faithfully made, and no facts abridged nor suppressed in the reports of the engineers-in-chief.

During the civil war mastless ships came into the navy. This foreshadowed the fact that steam had come to stay. When the engineer corps was established (act approved 31 Aug., 1842) a contention was believed to have been ended for all time. Among the first appointees there were as good scientific and practical engineers as could be found. It was particularly satisfafctory in that the service had a better hold on them, and by getting them when young they more readily adapted themselves to the service, and it was believed that the resignations would be less. Their examinations were rigid, especially that part relating to character, zeal, adaptability, etc. Notwithstanding this, they knew that fault was being continually found with them. In 1861, when the civil war began, a very large number of volunteer officers was appointed, including engineers. In 1864 the navy department determined (see secretary's report) to make the experiment of teaching midshipmen to run the engines and for this purpose the *Swatara* was selected. An engine similar to that of the *Swatara* was installed in the academy for purposes of instruction. Everything was done to make the experiment a success. Three first-assistant engineers were ordered to the *Swatara* as instructors, that there might be one on duty at all times; there were four machinists appointed to the vessel (the origin of the machinist system) to assist. After about six months' voyage the experiment was abandoned, and the usual number of engineers (one first, two second and two third assistants) were sent to the ship in place of the three first-assistants and the six midshipmen. It was the purpose, then, to have the midshipmen do the actual running of the machinery, as the engineers had done; not to stand a mere supervisory watch. Be it said to their credit that they took a genuine interest in it and did their utmost to carry out orders.

After this experiment the engineer-in-chief of the navy was pronounced against this system of amalgamation, and every succeeding engineer-in-chief has made strenuous efforts to strengthen the corps as originally planned, and protesting against the reduction of numbers. Notwithstanding this the number has been uniformly reduced, and the "amalgamation" was, in fact, an elimination of that useful class of officers.

The testimony of the engineers-in-chief has never been sufficiently considered; the hearings before committees in congress have not accorded a fair opportunity to the engineers to place their side on record.

Unless an engineer is proficient in the very details of his business, he must necessarily be at the mercy of his subordinates. The writer had exceptional advantages in practical engineering before he entered the navy, young as he was, but the experience he got in charge of a fire-room watch on board a flag-ship has been of more value to him than any experience of equal duration he has ever had. An engineer in the fire-room or the engine-room, like the watch officer of the deck on a ship under sail, is dealing with the elements of nature: it is essentially different from the routine drill

of a squad of men: he does not know what is coming next, but he is on the alert, depending on his discernment and his experience to meet an emergency. The two callings—deck and engine-room—require about the same ability and integrity.

If an object lesson is needed we have it in the *Bennington*. It is apparent in this case that an enlisted man was trusted to get up steam. This is, apparently, a simple matter; so is a surgical operation a simple matter to a skillful surgeon. When an engineer begins to raise steam in a boiler, he begins a conversation with that boiler: he trusts to no living man: he asks questions of the boiler and receives its replies. He ascertains if all openings that should be closed are closed; he fills the boiler to proper level with water and he notes about how warm that water is; he assures himself that none of the water is escaping; he will allow no fuel to go into a furnace until the water is at proper level; he examines his water gauges (all of them) and tries every one before lighting a fire. He looks over the dampers, smoke-pipe guys, ash-pit doors, grate bars, and safety valves; then charges the furnaces and lights the fires; he cuts off the air at ash-pits, to retard the rate of combustion, and begins his diagnosis to satisfy himself the boiler is warming up equally on both sides, by frequently laying his hand on the shell of the boiler. The careful engineer retards or accelerates the combustion in the different furnaces, that they may warm up equally; he knows the heated water rises directly above the crown sheets and descends through the outer water spaces; he cannot see it but he feels it and is just as conscious of it as if he were part of that boiler; as the time passes he takes a second, a third or maybe a fourth look at the water gauges; his mind is on what is going on *in* that boiler. When the water gets near the boiling point he opens his boiler-stops and his throttle and cylinder drains and jacket valves; he returns to the fire-room, asks the boiler if it is making steam and why the pressure does not show on the steam gauges; he compares the indications on the pressure gauges, and if there is a difference, he busies himself to learn why. As soon as he has pressure enough he starts his circulating pump (and air pump if it be independent) and again returns to the fire-room to interrogate the boiler; he gets steam on his feed pump, blowers, and steam jackets; trying each, between his visits to the boilers. From six to twelve hours are consumed in raising steam in such boilers as used in the *Beninngton*, but in the pipe-boilers it is safe to raise steam much more rapidly. But raising steam properly requires experience; one must be possessed of a liking for the business; he must concentrate his mind on it, and he must feel the responsibility. No one can stand between an engineer and his responsibility. He is dealing with the forces of nature, and nature never forgets nor makes mistakes. The engineer must apprehend all trouble where it is possible; he cannot drill a boiler or an engine as the sergeant drills the marine guard.

In 1871 congress again made laws fixing the relative standing of the engineers in the navy, which were accepted in good faith, and it was believed had settled all differences for all time. But it was not long before fault was found. Those of us who read the investigations by the house committee of naval affairs in 1876 will be able to say what a great variety of opinions there were relating to engineers and engineering.

In the opinion of the writer there can be no better scheme for an engineer corps than that devised by Mr. Haswell in 1842. His plan was to take the engineers all into the lowest grade when quite young; take them all from civil life, by competitive examination; let them commence in the fire-rooms, attending water; promote in classes by competitive examination: this had all the advantage of selection without any of the objections. Oblige each and everyone to have had at least two years' apprenticeship in a marine machine shop (not a kindergarten nor in making mechanical toys). It must be remembered that there are now many colleges graduating "mechanical engineers," and many of their young graduates would be only too eager to enter the service in a grade equal to that of the old third assistant, if suffered to compete for a commission later on. The service would now be able to get splendid talent in this way. Such men would develop, some into constructing engineers, some into skiillful sea-going engineers, and some would inevitably retrograde, being human; but these last would surely be identified and dropped by the examining boards. It is a pity to destroy Mr. Haswell's method, just at a time when so much could be gotten out of it.

Quite a number of the "machinists" in the navy are not machinists by trade, but get on very well where they do not comprise too large a percentage of the engine-room staff.

The door of promotion to the position of chief engineeer should be open to the assistant engineers, no matter by what title they are called. If this were possible, there would be applications from scores of excellent young men for admission into the service.

The profession, art, craft, trade, etc., of an engineer is so essentially different from that of the deck-officer that it seems to the writer to be unreasonable to either amalgamate or combine them. A permanent divorce, as is practiced in the merchant service, is the very best method to employ if we would secure efficiency. Harmony need not be expected; it is not natural. In the merchant service this was discovered early in the steam period, and all possible advantage has been taken of it there.

It was promised congress that the Personnel Bill, if passed, would end a disagreeable contention; the recent essay of Rear Admiral Luce, in the North American Review, and the several essays printed in daily papers and in this very journal since that time have proven that the question is still a burning one. When that bill was before congress it was currently reported that any person who lobbied against the Personnel Bill would be called to account by the department. This was printed in the dailies and in service papers. In the "hearings" before the committee on naval affairs there was testimony to the effect that the officers were almost unanimous in its favor, which might have been true for those of the engineer corps who were interrogated, but certainly I have found many more who were opposed to it than who favored it.

The bill looked so unreasonable and so un-American that the writer did not believe it could be passed, and judging from the questions asked by the Chairman Boutelle—in the house committee—during the "hearings," it may plainly be seen that he saw no good reason in it. There were others,

but I mention Mr. Boutelle because he had been an officer (and a gallant one) in the navy during the civil war.

I finally regarded the passage of that bill as the inevitable. In every community, every state, every nation there is a struggle between individuals, cliques and classes for supremacy. Some men climb the ladder of fame by their own superiority; some brow-beat their way; and others rise relatively above others by pushing the others down. This is human nature. It has been said that history repeats itself; it might better be said that human nature repeats itself. Every nation has been strong, prosperous, rich and great, just in proportion to its producing classes, *i. e.*, its mechanics, farmers, artists, etc., and when these begin to wane, the nation begins to decay. It was so in ancient Egypt; in Syria and Judea, Rome, Greece and in the ancient Flanders; it was so all through the dark and the Middle Ages. The last object lesson is that of Spain. Bancroft said the decay of nations began with the elimination of the middle classes.

To get the best results it is essential to employ specialists. If it were possible to select from those graduated at the academy and assign those to each specialty who has shown a marked aptitude, and keep them at those specialties all their lives, we could secure better results in every department; but if, on the contrary, we insist on requiring an officer to "qualify" in each and every department on board ship, that officer will spend his life qualifying, and prevent his acquiring the proficiency he would otherwise have attained in the specialty he loved most.

The writer belongs to a family of engineers and was not only satisfied with his title of chief engineer, but was proud of it. That part of the amalgamation which hurt most was the deprivation of the title of chief engineer; by the amalgamation he lost his identity.

The naval service is in training for an emergency—a battle that may decide the fate of the nation. In that supreme moment there should be no amateurs.

Assistant Naval Constructor W. McENTEE, U. S. Navy.—To express an opinion of any value on any subject requires that the person forming the opinion should be in a position to obtain the essential facts and have the ability to assign to each its proper weight in influencing his judgment. I hesitate, therefore, to express an opinion on any of the conclusions drawn in Lieutenant-Commander Chandler's paper entitled "Is Amalgamation a Failure?" except the one conclusion deduced from the data presented in the form of examination papers, photographs of practical drill in engineering at the naval academy, etc. That conclusion is "that from no engineering school in the world does any young man go forth better equipped to become a proficient engineer, either theoretically or practically, than from the Naval Academy of to-day." The sample examination papers given as those set at "a leading institute of technology," are readily recognized as coming from the Massachusetts Institute of Technology. As a comparatively recent graduate from the latter institution, as well as from the naval academy, and having completed the entire course in marine engineering at both places, I think it will be granted that in so far as access to the necessary data is concerned, I am qualified under one of the conditions stated

above to form an opinion of the relative efficiency of the systems of education in vogue at the two places.

I think Lieutenant-Commander Chandler has made the mistake of arriving at a conclusion which has for its basis insufficient data, so far at least, as the Massachusetts Institute of Technology is concerned. In the first place examination papers are not the safest evidence to be found as to the efficacy of the course in which they are given, and especially is this so at the Institute of Technology where not nearly so much importance is attached to results of marks obtained in examinations as is the case at the Naval Academy.

It may be well also to point out that the sample papers given for the Naval Academy are almost all for the first-class or the final graduating class, while those from the other institution are mostly from the second class, or as they are called there, the third year men.

But passing over these objections, I will attempt to show from the data given by Lieutenant-Commander Chandler that the graduate of the Naval Academy is in comparison with the graduate of the Massachusetts Institute of Technology seriously handicapped by weak places in his *theoretical* education in marine engineering. I have emphasized *theoretical* because there is so far as I know, no evidence before the members of the Naval Institute to show the nature of the *practical* instruction given in the course at the latter place. I purpose, further on, to give a brief outline of the system followed in the practical part of the course, but I think it best first to take up the shortcomings in the theory. The Naval Academy course fails almost completely to touch on a most important branch of science for the marine engineer, that is *thermodynamics.* I would say that it does lack this branch entirely, but some would probably point out that the course in physics includes a treatise on heat in which the first and second laws of *thermodynamics* are set forth and that Carnot's function and cycle are given. I venture to assert, however, that a great majority of graduates of the Naval Academy remember Carnot's function as an extremely nebulous entity which they had encountered in a still more nebulous treatise on heat; that it had its habitat in the 'Skinny" building from whence it was dragged forth once each year to grace the triumph of the midshipman's mind over "Math and Skinny." That the first and second laws of Thermodynamics and Carnot's function have any connection whatever with steam engineering is certainly not made clear to the student at the Naval Academy.

To give a concrete instance of the importance of a thorough knowledge of Thermodynamics, suppose it is required to know the velocity of steam flowing through a nozzle from a compartment in which the pressure is 150 pounds per square inch, to another compartment in which the pressure is 80 pounds per square inch. This as may be seen is a fundamental problem in the design of a steam turbine. Does the Naval Academy course supply the means for its solution? I think not. To solve it requires a knowledge of *entropy,* a complete understanding of which can only be obtained by a thorough course in thermodynamics.

That *entropy* is a most important quality of any substance used in a heat

engine, in fact equal in importance to temperature itself, it is only necessary to say that if these two qualities are given for any substance, the energy in a pound of the substance is determined absolutely.

Now, referring to the examination papers given in December number of the Naval Institute it will be found that the Naval Academy papers do not so much as mention Entropy. Compare that fact with the number of times it will be found in the papers set at the Massachusetts Institute of Technology and I think it will readily be seen that in this one respect alone the theoretical work at the Naval Academy is sadly outdistanced.

If space and time permitted I could give numerous other examples similar to the above which I think would show clearly that the young man from one school at least, in this country, starts off with a better theoretical equipment than does the graduate of the Naval Academy.

I think the Naval Academy graduate must admit that his course has not prepared him to grasp in full the theory of the steam turbine, and considering the great importance of that form of marine engine, it must be granted his education is lacking in a most important essential.

Another form of engine which is of great importance to the marine engineer is that of the internal combustion type, the most common example being the gas engine. What is there in the Naval Academy course to teach the principles of its design, construction, or efficient operation?

Next let us examine the data presented to show the nature of *practical* education. To a person wholly unacquainted with the system actually followed at the Naval Academy, the many interesting illustrations showing the cadets at practical work in the well-lighted, and seemingly well-equipped engineering laboratories would offer convincing testimony that this part of the work is well covered. If the person, however, be of an inquiring turn of mind and seeks further light on the subject, the most natural thing to ask for is some kind of evidence to show just what mental processes are induced in the cadets' minds or what conclusions are deduced by them from the observations made at practical work or "steam drill." Are they required to note by proper observations the various data required for determining, say, the efficiency of a boiler in a test of sufficient length to insure reasonably accurate results? Such a test would involve such important items to the engineer as grate area, heating surface, temperature and the analyses of waste gases, fuel efficiency, etc. I am afraid, at this early stage of his investigation, the searcher after light would be disappointed in finding that of the few tests made in the engineering laboratories, there is no record in the shape of individual or collective reports of tests made and the conclusions deduced by the various students from the data observed. If the student has shirked mentally and formed no conclusion whatever, the instructor does not know it, and worse still, if the student gets erroneous impressions on any point, the instructor has no opportunity of correcting them. The illustrations given by Lieutenant-Commander Chandler show that the authorities succeed in getting "the horse to the trough" of practical work, but fail to show how much the horse drinks, or whether he drinks at all. If some magic developer were applied to the films from which these illustrations were obtained, so that the thoughts of the cadets

would stand out for inspection, it would probably appear that about seventy-five per cent of them were thinking, not about their work, but about how many minutes of the drill period there still remained. This is quite natural. There is no reason why they should pay any close attention to the drill, as there is no subsequent examination on the subject, and once completed, is never recalled. It is easy to see that if reports of the various tests were required, that much closer attention to the work would result because the quality of the reports and the marking received on them would depend to a great extent upon the attention paid to the work in hand when the data were being obtained. Furthermore, these written reports would form a record which could be referred to later on in order to refresh the student's mind about any of the various things learned during his course. For instance, suppose the graduate of the Naval Academy has, during his course at that institution, made a complete efficiency test on a boiler plant and steam engine installation, and is ordered on a trial board for a battleship. It would undoubtedly be much easier for him to carry out his duty intelligently, if he has had this work to do previously and has a form from which to work. I think that officers who have had this duty to perform for the first time after leaving the naval academy will agree with me that it takes considerable skirmishing around in order to get a satisfactory basis of operations for conducting the trial trip or test to the best advantage.

In contrast with this system, or perhaps more aptly termed lack of system, there is given below a sample report submitted by a student at the Massachusetts Institute of Technology, giving the results of a test upon a triple expansion engine. All the data for this report were gotten in a drill period of two hours. The detailed computations required to be submitted with the report are not given because of the space they would occupy. The point I wish to bring out is that as a result of his practical work in the engineering laboratory, he has a great deal more work ahead of him in boiling down the data and preparing the report which, if not correct, is returned to him for correction before final approval.

In conclusion, I wish to say that there are many admirable features about the Naval Academy course, not especially in the marine engineering part of it, but in the whole academic system, some of which, undoubtedly, excel the corresponding features at other leading schools in the country, but what I should like to make clear to the members of the Naval Institute is, that the system, the text books, and the scope of work in the various branches at the Naval Academy is determined to a great degree by the graduates of the Naval Academy themselves, who have little opportunity for getting in touch with the latest and most advanced principles of technical education at the leading schools in this country. The result is that the system has grown up quite independently and has in it a number of points which could, undoubtedly, be eliminated or changed to advantage.

TEST ON TRIPLE EXPANSION ENGINE.
RUN AS A COMPOUND ENGINE.

No. April 2. Nov. 9, Rec'd.
Date Oct. 20, 1904.
Duration of test ..... 60 mins.
Revolutions per 60 mins..... 5033
Revolutions per min..... 83.9
Steam used in cylinder 60 mins..... 1067 lbs.
Barometer ..... 30.42 ins. 14.9 lbs.
Boiler pressure ..... 101.9 lbs.
Steam used, H. P. Jacket..... Mins. Lbs.
Steam used, I. P. Jacket..... Mins. Lbs.
Steam used, L. P. Jacket..... Mins. Lbs.
Steam used, 1st Receiver..... Mins. Lbs.
Steam used, 2d Receiver..... Mins. Lbs.
Vacuum ..... 23.77 ins. 11.7 Lbs.

DIMENSIONS OF ENGINE.

Diameter of Piston, High..... 8.99 ins.
Diameter of Piston, Intermediate ..... 16.01 ins.
Diameter of Piston, Low..... .... ins.
Stroke ..... 30 ins.
Diameter of Piston Rod, High..... 2.19 ins.
Diameter of Piston Rod, Intermediate..... 2.19 ins.
Diameter of Piston Rod, Low..... .... ins.

	High.		Intermediate.		Low.	
	Crank end.	Head end.	Crank end.	Head end.	Crank end.	Head end.
Piston Displacement, Cu. Ft.....	1.037	1.102	3.430	3.495	....	....
Clearance (Per cent. of P. D.)....	9.76	8.83	10.9	10.4	....	....
Engine constant	.004524	.004809	.01497	.01525	....	....
Cut-off (per cent of stroke).....	20.1	20.1	14.5	14.5	....	....
Release (per cent of stroke).....	99.0	98.0	98.5	98.5	....	....
Compression (per cent of stroke).	8.5	8.5	10.0	12.0	....	....
Pressure at cut-off.....lbs..	89.9	88.6	4.8	4.6	....	....
Pressure at release.....lbs..	17.7	15.6	—7.7	—8.0	....	....
Pressure at compression.....lbs..	9.7	11.1	—10.5	—10.2	....	....
Mean effective pressure.....lbs..	39.9	37.4	7.67	6.93	....	....

Horse-power.....30.24 High, 18.50 Int.....Low, 48.74 Total.
Weight of steam per revolution by tank.....210 lbs.
Weight of steam during compression per revolution .....03027 High, .01979 Int. .... Low.
Weight of mixture in cylinder per revolution .....24027 High, .22979 Int. .... Low.
Per cent of mixture accounted for as steam at cut-off..... 60.93 High, 37.25 Int. .... Low.

Per cent of mixture accounted for as steam at release	73.99	High,	61.63	Int.	Low.
Weight of steam at cut-off per revolution	.14722	High,	.10577	Int.	Low.
Weight of steam per H. P. per hour, by tank (including jacket steam)	21.69 lbs				
B. T. U. per H. P. per min. actual vacuum	383.70				
B. T. U. per H. P. per min. 2 lbs. absolute	372.18				
Quality of steam supplied to engine	.987				

Signed, A. B.

Professor PHILIP R. ALGER, U. S. Navy.—Mr. McEntee's criticism of the Naval Academy course of engineering requires an answer from some one familiar with that course, and at Lieutenant-Commander Chandler's request I have undertaken to reply to it.

Mr. McEntee's conclusions are based upon the assumption that he can correctly judge of the present engineering education of midshipmen by recalling his own education at the Naval Academy. The fallacy of this view may be seen from the following facts:

(*a*) Mr. McEntee was educated as a naval cadet, line division, for three years, during which the engineering course was quite elementary, as there was in the navy a separate corps for engineering duty only. Under the present arrangement every midshipman, immediately on entrance, starts in with work and studies in the engineering department, and continues that work throughout his entire academic career.

(*b*) At the end of Mr. McEntee's third year, the personnel law having become effective, he was thrown into engineering studies proper, in the midst of the somewhat chaotic conditions arising from sudden upheaval of a system and the consequent complete change in the studies of the entire body of midshipmen. He passed but one academic year under the new conditions, and that the first year of the present system.

Under these circumstances, Mr. McEntee's claim of knowledge "as having completed the entire course in marine engineering" seems hardly justified.

Mr. McEntee lays great stress upon the absence of evidence that midshipmen are taught thermodynamics. It is true that for the moment the exigencies of service have caused a shortening of the course of instruction to three and a half years, making it necessary to abridge the study of certain subjects. But a reference to page 873 of the December proceedings will show that thermodynamics was not altogether neglected during the year of Mr. McEntee's undergraduate life at the Naval Academy.

As to the statement that 75 per cent of the midshipmen are not thinking of their work when engaged in practical drills, I can only say that the officers on duty in the department of engineering do not agree with Mr. McEntee's opinion. The midshipmen are fully as attentive as any other general body of students.

The British Admiralty committee, of which Professor Ewing, quite an authority on thermodynamics, was a member, investigated very thoroughly the present engineering course at the Naval Academy, and their expressions of approval, verbal, as well as in their subsequently published report, are a sufficient contradiction of Mr. McEntee's ill-founded condemnation.

Battle of the Sea of Japan.

(SEE No. 116.)

Captain SEATON SCHROEDER, U. S. Navy.—The subject of Captain Wainwright's paper is, I think, the most interesting that has been brought to the naval mind for many years; and I think that the Institute has been most fortunate in obtaining so excellent a presentation of the matter.

Any critique which I may make upon the reasonings and deductions of the essayist is bound to be favorable, for the reason that, as will be seen by anyone who may take the trouble to read my own paper on the same subject, my own reasonings and deductions are the same in almost every detail. In point of fact, greatly to my own self-satisfaction, our conclusions are so similar on so many points that I think that it will not be amiss for me to say that not only was my Ms. sent in some time before the December number appeared, but I was actually unaware that Captain Wainwright had undertaken a paper until my own was practically completed, all but the copying. It has been therefore a pleasant development to me that our views coincide so precisely, and a source of selfish rejoicing that his expression of them was not submitted in the New Year's competition.

There is no possible dissent from the conclusion that in the battle the Japanese had the advantage of a superior personnel, due to various causes, some natural and fundamental, and others artificial and quasi-temporary. Whatever may have been the expectations beforehand, the conditions became most patent to all in studying the event. Still, that does not diminish interest in a consideration of the ways in which the Russian inferiority was evinced, or of the questions brought up affecting the material. The advantages which the victorious personnel enjoyed were, as epitomised by the essayist, the better training of officers which produced better handling of squadrons and ships and better fire control, and the better training of men which produced better shooting, and in addition the fact that they were veterans who had fought and had opportunity to recognize and correct their mistakes. The feature of being veterans is unfortunately at once the most important and the only unattainable during peace times. It but makes it the more necessary that we should be accustomed to act in concert, in order that the nerve-racking sensation of being under fire for the first time shall not be accentuated by self-evident and self-confessed lack of familiarity with individual and co-operative work.

It seems actually something of a relief to have pointed out to us that there was a reason for the commanding figure of to-day not doing what it

seemed most natural to expect that he would do, viz., strike the Russian fleet earlier with torpedo craft. The plan of action, as quoted by the essayist from the statement of Commander Akiyama, "was divided into seven stages, the first two of which we were not able to carry out on account of rough weather, etc." It is reasonable to assume that one of those stages was to be torpedo attack. Prone as tacticians are to give possibly undue weight to the last word in war manoeuvres, the plan of refraining from torpedo attack before a battle so as to ensure having all possible torpedo power available after the main action cannot be considered laid down by Admiral Togo as a governing principle. To neglect a possible opportunity of diminishing the number of the enemy's heavy ships before meeting them in battle would be an almost unexplainable negligence especially in a case where the number of torpedo craft was so overwhelmingly superior. It may certainly be accepted that it was only the heavy weather that saved Admiral Rojestvenski from attack during the night south of the Tsushima Strait.

The principal questions bearing upon material which engage attention are the importance of speed, the greater or less efficiency of single-caliber batteries, and bigger ships. There are certainly some eminent authorities who seem to decry the value of speed; but, as stated by Captain Wainwright, this is probably due in large part to the fear of sacrificing other more valuable qualities. Leaving out a few extremists whose contentions, I must say, are incomprehensible to me, I think that among the great mass of writers and of thinkers who do not write, it is very much as if one so-called school should say "Speed is very important but less so than guns," and another "Guns are paramount, but speed is also very important." While, on pages 800 and 801, the advantage of speed is dwelt upon, the essayist says a few pages before that: "That speed was not a vital point in the actual conflict it is proposed to show later." And this he does later by saying that it is true that had the Russians deployed, the advantage of speed would have been less apparent, and that if they had used the inner circle and fired straight the battle would have had another ending; this can only mean that if the gunnery of the two fleets had been equal, using the inner circle would have neutralized the enemy's superiority in speed and the tide of battle would have beeen determined by other agencies. Indeed the essayist says farther on "Speed is most valuable, but the slow fleet can prevent overlapping if properly handled. . . . ."

In regard to big ships with only big guns: I note with unqualified approval the statement that "There are not many who now believe that the gain in power of a *Connecticut* over a modern ship of similar design to the *Iowa* is sufficient to pay for increased cost of construction and maintenance." I was always opposed to increasing the size of battleships without commensurate increase in the power of the battery, and such increase was manifestly unobtainable when the number of heavy guns remained the same. The principle of mounting guns of only the one heavy caliber makes the coming bigger ship useful and desirable. Leaving a size that will carry eight 12-inch guns, the progress will be unavoidably in rather wide leaps, for the reason that each additional pair of such guns (with their turret, ammunition, and proportional increase of hull and machinery) will consume an irreducible minimum of increase of displace-

ment; and, the addition of only one pair being possibly unremunerative, the leap may be of two pair.

The essayist stands upon impregnable ground in the comparison of the general type of new vessel as exemplified by the *Dreadnaught* and the present type carrying only four heavy guns; though I am afraid (or rather I hope) that his picture of the *Dreadnaught* is a little optimistic. Under the conditions which must govern in future sea battles, the most important feature of power and disposition of battery will be in the weight of broadside fire; the opportunities for using end-on fire will be rare and short, and when a size of ship has been fixed upon that will carry eight guns and present all eight on either side, as in our forthcoming type, any further increase of size will be useless unless it materially increases that broadside fire. With this in mind, possibly, the naval world seems to be waiting with bated breath for the removal of the veil of secrecy thrown about the *Dreadnaught*, a veil so unprecedented as to show that the English have taken a leaf from the book of their Oriental allies.

Improvement of armor by which an equal resistance may be had with less thickness and weight, or diminished weight of machinery, or greater fuel economy, will, of course, increase a ship's efficiency on the same displacement or diminish the displacement for the same efficiency. There is little doubt that the former will be the direction of development; when a certain size has been once attained it is not likely that there will be a recession, but rather that increased efficiency will be sought on the same displacement. It does not seem worth while, however, to attain to that increased size for the purpose of merely increasing the total number of guns if the weight of the broadside is not correspondingly increased.

The essayist touches briefly upon one very important thing. "There were twelve flag officers, including Admiral Togo, all comparatively young, with the Japanese fleet." The people responsible for the growth and efficiency of that new fleet had the acumen to recognize that there is a limit to the size of tactical group that one man may successfully command. The varied appreciation of this fact by the other naval powers and ourselves is shown in the following comparative table, concerning which comment seems superfluous:

NUMBERS OF FLAG OFFICERS IN PROPORTION TO TONNAGE AND PERSONNEL.

	England.		France		U. S.*		Germany		Japan	
Tonnage built and building	1,907,998		800,958		701,797		588,062		427,871	
Flag officers	85		45		18		32		41	
Tonnage per flag officer.	22,447		17,799		38,989		18,375		10,436	
Blue jackets	95,263		52,153		37,000		35,113		30,339	
Men per flag officer	1,121		1,158		2,056		1,097		740	
	No.	%	No.	%	No.	%	No.	%	No.	%
Admirals of fleet	4	5	0	0	0	0	1	3	0	0
Admirals	11	13	0	0	0	0	4	13	2	5
Vice Admirals	23	27	15	33	0	0	8	25	14	34
Rear Admirals	47	55	30	67	18	100	19	59	25	61
		100		100		100		100		100

*See footnote on next page.

Captain S. W. VERY U. S. Navy.

My dear Dick.—When Robert Southey wrote, nearly a hundred years ago,

> And last of all an Admiral came,
> A terrible man with a terrible name,—
> A name which you all know by sight very well,
> But which no one can speak, and no one can spell,

he knew nothing of Rozhestvensky, nor of the punishment which awaited him, first by Togo's superiority afloat, and later at the hands of writers ashore the world over, who have given him probably, the worst orthographical drubbing ever received by a man of his prominence. Had Southey seen the list which Frank Marble gave to me nearly a year ago; a list of twenty-seven different methods of spelling the Russian Vice-Admiral's name, twenty-five of which are quoted from newspapers and periodicals, he might have continued:—

> A name which you all know by sight very well,
> But which no one can speak, and no one can spell,
> Without repetition suggestive of plagiary.
>
> Of methods already adopted, I'll wager he
> 'll copy at random, without fear of heaven,
> The one most grotesque of the whole twenty-seven.

If you write again concerning the battle of the Sea of Japan, and I hope you will, if you find material for a second article so interesting and instructive as that which appears in the current number (116) of the PROCEEDINGS OF THE NAVAL INSTITUTE, please take pity on the poor Russian, (and incidentally, on me), and spell his name as it should be, Ro-zhest-ven-sky,- or ski.

I enclose a copy of a letter which I addressed to the PROCEEDINGS in October last, hoping to induce our semi-official publication to fall into line with the *New York Evening Post* and the *Nation*, and to set a good example to other leading publications. My missionary work was non-effective; for in the current number, the name is mis-spelled in three different ways, in thirteen different places; and nowhere is it spelled correctly!

The mistake made in the name as given by numerous leading journals, is due in my opinion, to the fact that the greater part of our information concerning Rozhestvensky in the early stages of his voyage to the East, was derived from the French; and as pronounced in that language, Rojestvensky is correct. If in translating, we would render the French

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* The number of U. S. Flag officers is that permanently allowed in the naval establishment. At the present time there are one admiral and six rear admirals additional in grade; but, as they retire from service their places will not be filled, and the number given in the table is the number which will remain permanently under existing law.

sound of *j*, with the English equivalent *zh*, and spell the name accordingly, we would avoid the error which is repeated with such frequency, and by so many excellent authorities.

But the spelling which appears in your article, from page 780 to page 795, cannot be accounted for. The harsh sound of the English *j* is intensified by the *d* placed before it (instead of after it, as in the original and strictly correct method of spelling the adjective *rozhdestvensky*,) much in the same way as if we were to spell our word treasury, *tread-jury*. If you will consult the Russian Navy Register of 1905, in the office of Naval Intelligence, you will find on page 101 of the first volume, the Russian Vice-Admiral's name given in full, РОЖЕСТВЕНСКІЙ, Зиновій Петровичъ, and in that you see, there is nowhere, the "delta" (Д, д,) which in the Russian alphabet is the equivalent of our *d*-sound.

Another Russian name (Sviètlana,) appearing in your article, on page 790, impresses me as being susceptible of improvement. When I was on the Brazil station in 1872, the original Svetlana, a wooden corvette, visited Rio de Janeiro, with the Grand Duke Alexis as her first lieutenant. As a consequence of my slight knowledge of the Russian language, I was invited to dine with the Grand Duke and the Vice-Admiral; and another day, when calling with our own Admiral, the Russian Vice-Admiral presented me with a Russian book, "by instructions of the Grand Duke," as he said, and to encourage my study of the Russian language. The invitation to dine, is printed, and in French, and reads:—

Au nom de Son Altesse Impériale, Monseigneur le Grand Duc Alexis, le Vice-Amiral Possiet, Aide-de-Camp Général de sa Majesté l'Empereur de toutes les Russies, a l'honneur de prier Monsieur le Lieutenant S. W. Very, de vouloir bien venir à bord de la frégate Svetlana pour diner le 6 Juin, à 6 heures de l'après-midi.

On the fly-leaf of the Russian book, I find in my own handwriting, the name of the ship in English, *Svetlana* (as in the invitation), and in Russian, Свѣтлана. The third character, ѣ, when taken by itself, or at the beginning of words, has the sound of *ye* in *yet*. But in nearly all other cases, and this is one of them, it has the sound of *e* in *met*.

Pardon this long lecture; I promise not to offend again. Sincerely, yours.

SAM'L W. VERY.

(Enclosure.)

In the latest issue of the PROCEEDINGS OF THE UNITED STATES NAVAL INSTITUTE, No. 115, September, 1905, on pages 613, 615, 617, 620, 623 and 740, are given three methods of spelling the name of the officer who was in chief command of the Russian fleet in the Sea of Japan, in the latter part of May last. Conceding that the final syllables *ski* and *sky* are practically identical, these three spellings are reduced to two,—*Rodjestvensky and Rojestvensky*,—neither of which is correct; although the second form, which appears to be quoted from a letter written by Horace See to the *Army and Navy Journal*, approximates the English equivalent of the pronunciation of the Russian name.

To Lieutenant-Commander Frank Marble, U. S. N., Naval Attache at our Legations in Tokyo and Peking, I am indebted for a list of twenty-

seven methods of spelling the Russian Vice-Admiral's name. Twenty-five of these have been seen in print. The two other variations are quoted from a written letter, and accord with two of the printed twenty-five, except in the terminal syllable, which is written *ski*, where it is printed *sky*. Assuming as before, that these two forms of the final syllable are practically the same, the list of twenty-seven spellings reduces to twenty-one. Among these are the two quoted above from the current number of the PROCEEDINGS.

In May last, when returning from Japan, among my fellow-passengers, was a well-informed officer of the Russian Navy, who expressed the opinion that the Vice-Admiral's name pointed to an ecclesiastical ancestor, because of the proneness of ecclesiastics to adopt for the patronymic, the name of a holiday or festival associated with their calling. Whether this assumption is correct, or whether it is mere coincidence, the Vice-Admiral's name is identical with a derivative of the word Рождество, the sound of which, expressed in English, is Rozh-dest-*vo*, accented on the "vo." The meaning is *Birth*, or *Nativity*, or *Christmas*. The derived adjective, meaning *of Christmas*, or *of the Nativity*, was originally Рождественскій, the sound of which, expressed in English, is Rozh*dest*vensky, accented on the "dest." . In the course of time, from what a Russian grammarian calls "lax articulation," the *d*-sound was dropped, as it is from the pronunciation of other similar Russian words; and later usage sanctioned the omission from the spelling of the word, of the letter represented by our *d*. In Reiff's lexicon, edition of 1845, the word is given both ways,—Рождественскій, as above, and Рожественскій, which, expressed in English, is Ro*zhest*vensky, accented as before on the second syllable. It is in this second form that the Russian officer's name is given on page 101 of the first volume of the Russian Navy Register for the current year.

In the actual spelling of the Vice-Admiral's name, Рожественскій, the letters о, е, т, е, к and і, have the same, or nearly the same values as in English. The initial letter Р, is the English R. The с, is equivalent to our s. The в is English v, and the н is our n, while the final letter й, is one of the three Russian characters, (і, и, й,) equivalent to our i. Its function in this word appears to be simply to abbreviate still further, the short i which precedes it.

I have reserved until the last, the character ж, because it appears to be the letter which has provoked the greatest number of errors in the spelling of the Russian name. One of the best works of reference at my command says with regard to it; "ж is the French *j* in *jour;* the English *j* being represented in Russian by Дж, as Джонсонъ, Johnson." Another authority says: "As there is no equivalent letter in the English alphabet for this consonant, *zh* will represent the letter ж. The sound of *s* in the English words *treasure, pleasure,* or the sound of *z* as in the words *glazier, grazier,* represent well the sound of the consonant ж."

The object of this long letter is to endeavor to lead the PROCEEDINGS into the straight and narrow path. It will not be crowded. There'll be plenty of room; for in the list referred to above, the correct spelling of the name, *Rozhestvensky*, is accredited by my informant (whom I have quoted, by the way, without permission) to but two publications: the *New York Evening Post* and the *Nation*.

PROFESSIONAL NOTES.

Prepared by Professor PHILIP R. ALGER, U. S. Navy.

SHIPS OF WAR, BUDGETS, AND PERSONNEL.

AUSTRIA.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Erzherzog Karl	10,600	Trieste.	Under trial.
Erzherzog Friedrich	10,600	"	" "
Erzherzog Ferdinand-Max	10,600	"	Building.

The battleship Erzherzog Friedrich has completed a series of revolutions. At 130 revolutions the power was 15,440 horsepower, and the speed was found to be 19.7 knots; at 101 revolutions per minute the power was 6700 horsepower, with a coal consumption of 1.847 lb. per horsepower per hour; at 115 revolutions per minute the power was 9800 horsepower, and the consumption 1.55 lb. per horsepower per hour; at 126 revolutions per minute the power was 14,100 horsepower, and speed 19.06 knots, and coal consumption 1.785 b. per horsepower per hour; at 137.7 revolutions per minute the horsepower was 18,340, and speed 20.57 knots. The speed and power contracted for were 19¼ knots, with 14,000 horsepower. The machinery has been constructed by the Stabilimento Tecnico of Trieste, and the boilers were of the Yarrow type.—*Engineer.*

BRAZIL.

An explosion occurred on January 22d in the powder magazine of the Brazilian battleship "Aquidaban" at the port of Jacarepagna, near Rio de Janeiro, and she sank immediately. Of 300 persons on board, including four rear-admirals, only one officer, who was on deck, is said to have been saved. The "Aquidaban" was a vessel with a history. Built in 1885 at Messrs. Armstrong's works at Elswick, she was for many years the most powerful war vessel owned by the Brazilian Government. In 1893 she fell into the hands of the Insurgents, and was responsible for much of the trouble that the then Government went through. Later on she was sent to North America to represent Brazil at the Chicago Exposition, and was recognized then as being the largest and most powerful fighting ship at the demonstration. Her displacement was 5000 tons, and her gross horsepower 6000.—*United Service Gazette.*

FRANCE.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships			
République	14,865	Brest.	Launched Sept., 1902.
Démocratie	14,865	"	" May 2, 1904.
Patrie	14,865	La Seyne.	Under trial.
Justice	14,865	"	Launched Oct. 27, 1904.
Verité	14,865	Bordeaux.	Building.
Liberté	14,865	St. Nazaire.	Launched April 19, 1905.
A 15	18,000	Brest.	To be begun in 1906.
A 16	18,000	La Seyne	" " " " "
A 17	18,000	....	" " " " "
Armored Cruisers.			
Ernest Rénan	13,644	St. Nazaire.	Building.
Jules Michelet	12,550	Lorient.	Launched Aug. 31, 1905.
Victor Hugo	12,550	"	Under trial.
Edgar Quinet	13,644	Brest	Building.
Waldeck Rousseau	13,644	Lorient	"

THE SHIPBUILDING PROGRAMME.—In May last the Higher Council of Marine drew up a statement of the future requirements of the French Fleet. The force contemplated embracing five squadrons, each consisting of six battleships, with four spare vessels—34 in all.

There were to be five divisions of armored cruisers of the first class, with three spare cruisers—18 vessels altogether; while twelve scond-class armored cruisers were thought necessary for foreign stations, with six spare units for unforeseen emergencies. In addition to these, six "Scouts" for reconnoitring purposes were included in the programme. One destroyer was suggested for each battleship, with six more for Eastern waters, and 58 other destroyers, to be attached to the various divisions of torpedo craft, in all 109 destroyers. Forty-nine submarines for purposes of defence, and 82 submarines and submersibles capable of taking the offensive with 170 torpedo-boats, completing the list.

The Rapporteur of the Budget, M. Charles Bos, has recently issued his report on these proposals. In his introduction he points out that it would be well to fix definite limits to the life of each class of vessel. He puts the life of a battleship at 25 years, of an armored cruiser at 20 years, of a submarine at 15 years, and of a torpedo-craft at 11 years. These figures, says "Le Yacht," appear quite reasonable.

Accepting this estimate, the programme of construction, extending from 1906 to 1919, would require six battleships, as compared with the 11 of the Budget proposals; three first-class cruisers instead of ten; 15 second class cruisers, as compared with six; and six "Scouts." There would be 79 destroyers instead of 66, and 82 submarines in place of 90.

The protected cruisers will have disappeared by 1919, being replaced by vessels of higher military value.

A comparison of the proposed fleet with that existing at present exhibits the following figures:—

	1905		1919	
Battleships, first-class	11	30	16	34
Battleships, second-class	10		18	
Coastguard vessels	9		—	
Armored cruisers, first-class	10		18	
Armored cruisers, second-class	9		18	
Protected cruisers or "scouts"	29		6	
Destroyers	50		109	
Submarines	31		49	
Submersibles	7		82	

This comparison presupposes that the proposals of the "Rapporteur" are adopted, and not those of the Budget. It is doubted, however, whether so formidable a programme will be found practicable in the time allotted for completion.—*United Service Gazette.*

ARMAMENT OF NEW BATTLESHIPS.—The armament contemplated for the three battleships to be laid down in 1906, which form the first instalment of the new programme of construction to be shortly commenced for the French navy, consists of four 12-inch guns, twelve 9.6-inch, sixteen 3-inch, eight 1.8-inch guns, and two torpedo tubes. In France, therefore, as in other countries, the influence of the teachings of the Russo-Japanese war makes itself felt in the disappearance of guns.

The "Rapporteur" of the Budget, M. Charles Bos, suggests that it would be preferable, if possible, to have but one caliber for the principal armament, viz., that of 11 inches, a new weapon, which, in spite of its lower caliber, is somewhat superior in its ballastic properties to the existing 12-inch gun.

The adoption of a single calibre, it is pointed out by M. Bos, would have this important advantage, that in the event of a ship's magazines being emptied, she could readily supply herself from those of some other vessel. Moreover, improved gun practice could hardly fail to result from the unification of calibre.

Desirable as the simplification would undoubtedly be, there is the formidable objection that this new 11-inch gun can hardly be said to be in existence at present, whereas the 12-inch and 9.6-inch guns have been thoroughly proved, and are already available. At the same time, he continues, a sufficient number might be turned out in a period of three years and a half, which will probably be the time required for the construction of the battleships shortly to be laid down. He urges, therefore, that the 11-inch guns hould be commenced as soon as possible. Not until the impossibility of their construction in the period mentioned has been completely demonstrated should the naval authorities fall back upon the mixed armament of 12-inch and 9.6-inch guns. For the sixteen 11-inch guns, mounted in eight pairs of turrets, which the new battleships might carry, would render them very formidable opponents.

With regard to the smallest guns, "Le Yacht" remarks that the 1.8-inch and 2.6-inch calibres have proved inefficient, nor does he consider the caliber now proposed, of 3 inches, sufficient. Such guns were found by both Russians and Japanese to be inadequate, and already Austria uses guns of 3.2 inches, and Germany 3.5 inches. For what purposes, it is asked, are these small guns required? If to assail torpedo craft at close quarters and the superstructures and other unprotected portions of the large vessels at greater distances, then even the 3-inch caliber is insufficient. It would be better to adopt at once the 4-inch caliber already in existence. By this gun seven or eight shots per minute can already be fired, and the number could probably be increased without difficulty.—*United Service Gazette.*

DOCKYARD NOTES.—At Brest the attention of the yard is concentrated on the work of completing the two new first-class battleships *République* and *Démocratie;* the shells and turrets of the first named are in place and ready to receive the armor, which has all been delivered alongside the ship, and she is receiving her first coat of paint outside since she was launched. Although launched over a year later, the *Démocratie* is almost in as forward a state; all her side armor is in place, and the armor bases for the turrets of the 19.4-cm. (7.6-inch) guns are also fixed. The progress made with the *Démocratie* shows how much more economical it is to build a series of ships of one design. The difference in the armament of the two ships, viz., the substitution of ten 9.4-cm. (3.7-inch) guns in the *Démocratie* for the eighteen 16.4-cm. (6.4-inch)) guns of the *République,* will not cause any delay.

Work on the construction of the new armored cruiser *Edgard Quinet,* which was recently laid down in the yard at Brest, is now in full swing. The work, also at the same yard, of the reconstruction of the armored cruiser *Dupuy de Lôme,* the first real armored cruiser ever built, is proceeding rapidly and satisfactorily. The new Normand small-tube water-tube boilers are in place; the after military mast has been removed, a smaller and more stumpy one taking its place, which does not rise much above the after bridge, but there are two platforms, on the lower one of which will be carried four 3-pounders, and the upper one a search-light; the foremost military mast has also been shortened

At Lorient, work on the new armored cruiser *Victor Hugo* is proceeding satisfactorily; the armored turret for the foremost 19.4-cm. (7.6-inch) guns has been now finished, and it is hoped she will soon be ready to commence her trials. She and her two sister ships, the *Gambetta* and *Jules Ferry,* will by the end of the present year be ready to form a small but really homogeneous and powerful little squadron of armored cruisers.

The new first-class armored cruiser *Jules Ferry* has completed her trials satisfactorily. At her full-speed trials the engines developed 29,200 I. H. P., or 1500 H. P. over the contract, giving her an estimated speed of 23 knots. For some reason the bearings on the measured mile do not appear to have been accurately taken. At her 24 hours' coal-consumption trial, with the engines making 107 revolutions and developing 16,508 I. H. P.,

the coal consumption per horsepower per hour was 744 gr. (1.48 lbs.). At a further run of six hours' duration, with the engines developing 17,000 I H. P., the coal consumption was 710 gr. (1.43 lb.); with the fires lighted under four of her boilers only, the engines developed 8500 I. H. P., giving a speed of 16 knots. The ship is fitted with the Guyot-Du Temple small-tube boilers, which are fitted in most of the torpedo-boats. She is to be commissioned almost immediately and will then undergo, so it is reported, a series of competitive trials with her sistership, the *Léon Gambetta*.—*United Service Institution.*

THE NEW DESTROYERS.—Not less than 15 destroyers will have been commenced this year, seven in the Government arsenals and eight in private yards. Besides that it is a larger number laid down than in any previous year, 1905 will be noted for an interesting experiment which makes a new departure as regards these small vessels.

The objections that may be made to our type of destroyers is that they cannot maintain their speed in any sea-way, and also their vulnerability. This latter affects chiefly the compartments containing the machinery and boilers, where damage that may completely disable the vessel may be caused by the smallest projectile.

It is this which has led to the consideration of giving some armored protection to the vital parts, and a trial in this direction is about to be made. Two of the destroyers under construction are to be armored with 40-mm. (1.57-inch) or 50-mm. (1.06-inch) plates, the exact thickness not having been yet determined on The armor is to cover the engines and boilers and vital parts of the vessel, and will render those parts invulnerable to 47-mm. (1.85-inch) and 57-mm. (2-24-inch) projectiles at any range, and to the 76-mm. (2.99-inch) gun, which is the new caliber adopted by foreign nations for torpedo defence, at 2000 meters and over. This light cuirass necessitates an increase of the tonnage from 450 tons to 470 tons, a displacement, it may be mentioned, already surpased by the new destroyers of 525 tons of the English navy.

The speed will be less than that of the present type of destroyer, being 25 knots instead of 27 knots; but the loss of two knots speed will be fully compensated for by the power to maintain a high speed in rough weather.

Forward and aft in the non-protected compartments are to be placed turbine pumps for quickly clearing the vessel of water admitted by damage in action.

There are already in our navy armored torpedo-boats, which have given good results, such as the sea-going boats of the *Sirocco* class, which have been given a light armor, but they have the defect that the increased weight has been compensated for by the reduction of the coal carried. The larger dimensions of the new destroyers will admit of this defect being remedied.

The plans are by Messrs. Normand.—*Le Yacht* and *Le Temps.* (Translation from *United Service Institution.*)

The French Minister of Marine has decided to make a charge in the proposed armament of the new armored cruisers *Edgar Quinet* and *Waldeck-Rousseau.* They were to have had four 7.6-inch guns coupled in two turrets, and sixteen 6.4-inch guns. The latter are now to be changed for ten of the larger caliber, of which six will be placed in turrets and four in casemates. The principal armament of the new cruisers will therefore consist of fourteen 76-inch guns, and the ammunition supply will be greatly facilitated. The *Moniteur de la Flotte* says that the perforation of the 6.4-inch guns at 2000 meters (2,100 yards) is ten inches, while at the same range the 7.6-inch gun will perforate 13.3 inches of Harveyed steel, and at 6000 meters (6560 yards) its perforation would be 6.8 inches, as compared with 4 inches for the smaller gun. The *Moniteur* states that the principal armament of these two cruisers will be able to attack at 6000 meters the water-line armor of all cruisers now afloat and even of certain battleships, notably those of the *Canopus* class.—*Army and Navy Gazette.*

GERMANY.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Lothringen	13,200	Danzic.	Launched May 27, 1904.
Deutschland	13,200	Gaarden.	" Nov. 19, 1904.
Pommern	13,200	Stettin.	" Dec. 2, 1905.
Hanover	13,200	Danzic.	" Sept. 26, 1905.
		(Schichau Works.)	
Q	16,000	Kiel.	Building.
R	16,000	Danzic.	"
Armored Cruisers.			
Ersatz Bayern	16,000	.....	Ordered.
" Sachsen	16,000	.....	"
C	11,500	Bremen.	Building.
D	11,500	Hamburg.	"
E	11,500	.....	Ordered.
Protected Cruisers.			
Danzic	3,200	Danzic.	Launched Sept. 23, 1905.
Koenigsberg	3,200	Kiel.	" Dec. 1905
Leipsig	3,200	Bremen.	Launched, Mar. 22, 1905.
O	3,400	Danzic.	Building.
Ersatz Wacht	3,400	Stettin.	"
" Blitz	3,400	.....	"
" Pfeil	3,400	.....	Ordered
" Komet	3,400	.....	"

NEW BUILDING PROGRAMME.—It has long been known that a new navy bill would be introduced this year in Germany. The German Navy League has been very active, and all the exponents of naval expansion in the Press have ceaselessly urged the Government onward, which, on its part, was nothing loth to enter upon a wider programme. The main features of the new bill, which has been accepted by the Federal Council, are a great increase in the tonnage of the battleships to be constructed under the programme of 1900, with the consequent increase in cost. The dimensions intended are not stated, but the estimated cost rises from £1,214,000 to £1,825,000. It is also intended to lay down six large cruisers for foreign service, which our readers may remember were rejected by the Reichstag some five years ago. They will practically be small battlships, each of them costing £1,375,000, as compared with £908,500 for the recent vessels. The new programme also includes twenty-four torpedo-boat divisions, of 144 destroyers, instead of sixteen divisions, or ninety-six boats as originally contemplated. Each division will cost £443,500 instead of £360,500. Finally, there is to be an annual appropriation of £250,000 to defray the cost of the construction of submarines and of preliminary experiments with this species of craft. It is pointed out in the preamble of the bill that during recent years the size of warships has had to be increased in consequence of the more powerful armament and greater speed required The bill makes no provision for the enlarging of the Kaiser Wilhelm Canal, which will become necessary if vessels of very great tonnage are to pass through it. It would appear that the constructors will have some difficulty because of the shallow waters of the Baltic, which the great ships will have to navigate, and which have led, even with present displacements, to the grounding of battleships on more than one occasion. The total increase of men, excluding non-combatants, which will be necessitated up to the year 1920, will be 18,124, and the number of officers 605.—*Army and Navy Gazette.*

PROGRESS IN 1905.—The *Marine Rundschau*, in its survey of the progress of the German navy last year, remarks that the political and military lessons and consequences of the Russo-Japanese war were of particular importance because they impressed upon the German people the high value of sea power, of which a few years ago the Germans knew almost nothing,

One result was to cause the new navy bill, adding to the programme of 1900, to be passed through the Reichstag undiminished, involving an increase in the size of battleships and of the number of torpedo craft, besides much else. The *Rundschau* records the launches of the battleships *Hannover* and *Pommern*, and of the small cruisers *Leipzig*, *Danzig* and *Königsberg*. The armored cruiser *C* of the programme of 1904, and the battleships *Q* and *R*, the armored cruiser *D*, the small cruiser *Ersatz Blitz*, a tender, a surveying ship and a mining vessel of the programme of 1905, are in hand. In course of completion are the battleships *Lothringen* and *Deutschland*, and the ships ready for trial or completed are the battleships *Preussen* and *Hessen*, the armored cruiser *Yorck*, the small cruisers *München*, *Berlin* and *Lubeck*, the surveying ship *Planet* and the destroyers *S* 126 to *S* 131. The destroyers of the series *S* 120 *to S* 125, the last named being a turbine boat, have been under trial during the year, the slowest speed boat being the 122 with 27 knots, and the highest speed the 124 with 28.3 knots. The turbine boat, which is larger, displacing 446 tons, as compared with 390 tons, had a mean speed of 26.6 knots.—*Army and Navy Gazette.*

The German cruiser *Ersatz Wacht* is to be built at the Vulcan Yard, Stettin, and will be supplied with turbines. These will be provided by the German Parson's Turbine Company, and the *Marine Rundschau* states that they will provide for 13,600 H P., and for a speed of 24 knots. The displaçement will be 3410 tons, as compared with 3250 tons in the case of the *Lubeck*, which has a speed of 23 knots. Turbines are also to be supplied to one of the series of destroyers *G* 132 to *G* 137, which are to be built in the Germania Yard, Kiel.—*Army and Navy Gazette.*

We learn from *Ueberall* that the new series of German destroyers *G* 132 to *G* 137 to be built at the Germania Yard, Kiel, are to be larger than their predecessors. They will displace 570 tons and have a speed of 30 knots. It may be remembered that the increased size both of battleships and torpedo-boats was one of the causes of the demand for increased supplies under the Navy law. One of the new boats will probably be fitted with turbines. In relations to this matter it is interesting to learn from the German papers that the Navy Department has chartered the *Kaiser* of the Hamburg-America line, and the *Marine Rundschau* states that the purpose is to test the value and handiness of turbine vessels from the naval point of view. Many proposals have been made to test various classes of turbines for the German fleet, and *Ueberall* states that those of the *Kaiser* are not of the Parsons type. When the *Kaiser* was under trial at Flensburg the Emperor and many superior officers were on board.—*Army and Navy Gazette.*

DISTINGUISHING MARKS OF GERMAN WARSHIPS.—The system of distinguishing German battleships by rings painted on the funnels, which has been in vogue for some time, is to be still further extended. With the entrance of the *Preussen* into the battle fleet, and the latter joining of the new battleship *Hessen* and the *Kurfürst Friedrich Wilhelm*, as well as the transfer of the *Kaiser Friedrich III.* from the first to the second squadron, the rings on the funnels of the various ships will be as follows: Battleships—*Wittelsbach*, one black; *Zähringen*, two black; *Mecklenburg*, three black; *Wettin*, four black; *Kaiser Friedrich III.*, one white; *Kaiser Karl der Grosse*, two white; *Kaiser Wilhelm der Grosse*, three white; *Preussen*, one red; *Braunschweig*, two red; *Hessen*, three red; *Elsass*, four red; *Kurfürst Wilhelm*, one yellow; *Wörth*, two yellow; *Brandenburg*, three yellow; *Weissenburg*, four yellow. Cruisers—*Friedrich Karl*, one black; *Hamburg*, two black; *Medusa*, three black; *Arcona*, four black; *Prinz Heinrich*, one white; *Berlin*, two white; *Ariadne*, three white; *Frauenlob*, four white. Tenders—*Blitz*, one black; *Pfeil*, one red. The flagship *Kaiser Wilhelm II.* will not have any ring round her funnel.—*United Service Institution.*

THE HEALTH OF THE NAVY.—The health report of the German navy during the service year 1902-3 has been published, and affords very satisfactory reading. Since 1889 the disease rate has been reduced by 26 per cent. of the effective. Since 1898 the reduction has been uninterrupted until the death rate has reached the low figure of 5.55 per 1000.

This result is due to the efforts to improve the hygienic conditions. Special attention has been paid to the men's quarters. The first improvements were made on the battleships of the *Kaiser* class, where the quarters were made more lofty—more airy, therefore—and better lighted. The ventilation of the engine rooms and stokeholds received special attention. Greater attention still has been paid to this on the battleships of the *Wittelsbach* class, in which the ventilation is such that excessively high temperatures are avoided even in the most unfavorable positions. From 1899 to 1901 the cases of heat apoplexy numbered 117, of which 22 occurred on land during the China expedition. In 1901-2 there were only 19 cases, and in 1902-3, with an ever-increasing navy, only 22 cases, of which those in the engine rooms and stokeholds were purely accidental. The vessels are heated in winter by means of steam. All the lighting is by electricity. It has of course not been possible to carry out the sanitary improvements in the smaller vessels to the degree reached in the battleships, but it has been done as far as circumstances would allow. Fresh meat is the order of the day, and the refrigerators enable this to be served even during the longest voyages. The food is abundant and varied, and its nature, as in the army, is controlled by the medical officers. There is a vigorous campaign against alcoholic drinks, the use of which is decreasing, while that of tea, coffee, lemonade, and acidulated drinks is increasing. The grog allowance has not been formally stopped, but the substitution has been authorized of tea and coffee, and is generally prevalent. Grog is till served as a stimulant in exceptional cases of extreme fatigue. Scurvy, formerly so prevalent, has practically ceased to exist, there being only one case from 1899 to 1903, and that on land during the China expedition. In 1902-3 the number of cases of acute or chronic alcoholism was only 27—that is to say, 19 per 1000 of the effective. The supply of drinking water is carefully watched, and where there is the least doubt as to its wholesomeness the water is boiled. Baths are frequent, and men from the engine-rooms and stokeholds can take a warm bath each time they come off duty. Cold baths are largely used in warm weather. The teeth of the men are examined at regular intervals, and the men are instructed in the care of the teeth, and are supplied with tooth brushes. The junior surgeons are expected to study dentistry, and later to qualify as dentists. That the improvement in sanitary conditions is not confined to the German navy is shown by the health report of the garrison of Kiao-chau, where the proportion of deaths per 1000 to the total effective for the four years ended 1903 has been respectively 17.39, 15.84, 11.70 and 10.57.—*Marine Rundschau, Neue Preussiche Kreuz-Zeitung*, and *Neue Militärische Blätter*. (Translation from *United Service Institution*).

GREAT BRITAIN.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Dreadnought	18,000	Portsmouth	Launched Feb. 10, 1906.
Lord Nelson	16,500	Jarrow (Palmer).	Building.
Agamemnon	16,500	Glasgow (Beardmore).	"
Africa	16,350	Chatham.	Launched May 20, 1906.
Britannia	16,350	Portsmouth.	" Dec. 10, 1904.
Hibernia	16,350	Devonport.	" June 17, 1905.

Name.	Displacement.	Where Building.	Remarks.
Armored Cruisers.			
Minotaur	14,600	Devonport.	Building.
Shannon	14,600	Chatham.	Launched May 20, 1905.
Defence	14,600	Pembroke.	Building.
Warrior	13,500	Pembroke.	Launched Nov. 25, 1903.
Cochrane	13,500	Glasgow.	" May 20, 1904.
Natal	13,500	Barrow.	" Sept. 30, 1905.
Achilles	13,500	Newcastle.	" June 17, 1905.
Invincible	15,000	Newcastle.	Ordered
Class	15,000	Clydebank.	"
	15,000	Glasgow	"

ESTIMATES FOR 1906-1907.—The British naval estimates for 1906-7 propose a net total expenditure of $159,347,500, being $12,500,000 less than the estimate for the present financial year.

In his explanatory statement the First Lord of the Admiralty says that for the present financial year ending April 1 there will have been completed three battleships, eight armored cruisers, one second-class cruiser, eight scouts, sixteen torpedo-boat destroyers and thirteen submarine boats. On April 1 there will be under construction six battleships, ten armored cruisers, twelve coastal destroyers, five ocean-going destroyers, including one which will be the fastest of its type; one royal yacht and fifteen submarine boats.

It is proposed, the statement continues, to begin, during the coming financial year, four armored vessels, five ocean-going destroyers, twelve coastal destroyers and twelve submarine boats. It is hoped that the battleship Dreadnought will be commissioned at the beginning of 1907.

It has been decided to adopt turbines for all of the vessels provided for during the present year. Oil will be largely used in the British navy in future, experiments having proved that it is most successful, and installations are in progress in all new vessels and appliances fitted in some old ones, such as the battleships Caesar, Majestic, Magnificent and Victorious, while other vessels are brought up to date.

The First Lord of the Admiralty remarks that the question of firing guns by dynamo power has been settled and that wireless telegraphy has been extended. Three new stations will be erected. Th comfort of the crew is receiving greater attention, improved appliances for cooking as well as bakeries being introduced. New ships, also, will have better sanitary, ventilating, warming and washing arrangements and the use of electricity for all purposes continues to increase.

Many improvements have been introduced at the dockyards and training schools.

The decrease in the estimates is caused by a saving of naval stores, dockyard wages, victualling and clothing. Less will be spent for construction, but more for armor and guns.

It has been decided to reduce the royal marines by 1500 men.—*Baltimore Sun.*

WARSHIP CONSTRUCTION IN 1905.—From some points of view the most important feature in a review of warship construction during the closing year must be the decisive action of the Board of Admiralty in the direction of reform, not only in reference to the work done by contractors, but particularly to that carried out in the dockyards. We have been steadily moving forward in the matter of rapidity in warship construction, which of itself constitutes an element in economical production, while, at the same time, all new ships have been, upon completion, placed in commission, affording the nation an earlier return on capital expenditure, and bringing officers afloat sooner into line with progress in practical science. These advantages have been more fully realized by the present board than by any of its predecessors, a fact which is entirely due to the advocacy of Sir John Fisher, whose recent advancement to the position of Admiral of

the Fleet secures his services to the country for several more years, so that the reforms that he has advocated are much more likely to be realized. Hitherto three years has been regarded in this country as a very satisfactory period for the construction of a ship, from the completion of the plans to the flying of the pennant; and for large armored cruisers a corresponding period was required. As a consequence of reforms it is now anticipated that under normal conditions the largest of the present-day ships will be completed well within two and a half years, an achievement which is very satisfactory, in view especially of the increase in the number of guns and gun-mountings required, and generally in the size and power of the ship. The dockyards have during recent years been greatly improved, and at the moment when Sir James Williamson, C. B., is demitting office as director of dockyards, after fifteen years' service, everyone recognizes the work he has done during a period of great pressure. His successor, Mr. J. B. Marshall, C. B., has been trained in the service, and there are probably few with such a wide knowledge of naval construction in the dockyards, which, combined with an active, progressive temperament, will ensure a full realization of the new conditions to be brought into force with the beginning of the New Year. One great advantage is that he will have an executive assistant at the Admiralty, to relieve him of a large part of the time-absorbing clerical work, and that he will thus be able to visit very frequently the dockyards and private establishments, accompanied in all cases by an engineering assistant; he will thus be thoroughly cognizant of all that is going forward, and will be able to ensure that there is co-ordination in procedure. As a consequence, it has been found possible to dispense with the civil technical assistants to the Admiral-Superintendents of the Dockyards, as Mr. Marshall will be almost continuously in personal association with the officers at the Royal Works. The chief constructors and chief engineers of the three large establishments at Chatham, Portsmouth and Devonport are to be known as "managers," and are to act with the same power and authority as the managers of private concerns under their managing directors. They will also have complete command over the supplies, and will be free to employ or discharge men who are upon the hired list. The probabilities, therefore, are that in addition to rapid construction there will be increased economy.

In the future the intention is to have on the stocks in two of these yards one large ship, with another completing after launching, so that there will be sufficient facility for the education of the staff and men, and for keeping them in a satisfactory state of efficiency for the extensive repair work which is, after all, the most important function of the royal establishments. This repair work is being systematized; all new ships are at once put into commission for only two years, a much more careful record is taken of work done on the ships and on the machinery, while the engineers on board are encouraged to do more overhaul work than formerly. During the past year a very considerable amount of repair work has been done, six battleships having been dealt with—namely, the Trafalgar, Prince George, Renown, Nile, Jupiter, and Royal Oak—while twelve cruisers have had extensive repairs. It will therefore be understood that while the record of new work can never be large, in comparison especially with the great commercial establishments, the business done is extensive and important.

Only three new ships have been launched from the Royal Dockyards—two battleships and a cruiser; while from private yards there have been floated three similar armored cruisers, a scout, and nine torpedo-boat destroyers, all of them of 25½ knots' sea speed. These, with submarine craft, make up the total of twenty-three fighting ships for the navy, with a total displacement of 96,200 tons; while the collective horsepower of the propelling machinery is 212,500 indicated horsepower.

The number of ships is considerably less than the average of the past four years. Thus, in 1904 there were thirty-five vessels, of 124,652 tons,

launched for the navy, and in 1903 thirty-five vessels, of 148,746 tons. In 1902 the total was about the same as this year, but in 1901 the tonnage was more than double that of the closing year. In other words, the average tonnage of the four preceding years was 143,000 tons, which is nearly 50 per cent. more than this year.

The horsepower is proportionately less. The total of 212,000 horsepower compares with the 359,000 in the previous year, 320,000 in 1903, and 185,000 in 1902.

Fortunately, a larger amount of foreign warship work has been turned out, due principally to the launching of two battleships for the Japanese navy—the *Katori*, built and engined by Messrs. Vickers Sons and Maxim, Limited, and the *Kashima*, built by Sir W. G. Armstrong, Whitworth & Co., Limited, and engined by Messrs. Humphrys, Tennant & Co., Limited. The remaining work was torpedo-craft by Messrs. Yarrow, so that the total tonnage of fighting ships launched in 1905 is about the average, the displacement tonnage of the twenty-seven vesels included being 129,945 tons—2500 tons more than the previous year; but the machinery is only of 260,000 horsepower, or 100,000 less than the previous year.

In Table III. we give the production from each of the naval yards. It will be noted that Portsmouth has not this year launched any vessel. In

Yard.	1905		1904		Totol for 16 Years	Average for 16 Years.
	No.	Tons.	No.	Tons.	Tons.	Tons.
Portsmouth	—	—	2	32,700	206,131	12,883
Chatham	1	16,350	1	10,850	207,562	12,973
Devonport	1	16,350	—	—	165,118	10,320
Pembroke	1	13,550	1	13,550	155,020	9,689
Sheerness	—	—	—	—	31,299	1,956

the previous year there were two battleships included, and the second of these is now nearing completion. The establishment has also been fully engaged on the *Dreadnought*, which is to be constructed in an unprecedentedly short period, and although it is only four months since the plans were forwarded to the establishment, nearly 5000 tons of material have already been worked into the structure, and the probabilities are that the vessel will be launched in less than six months from the actual beginning of work. Sheerness has not launched any vessel, either this year or last year; indeed, this establishment is for the future to be practically confined to the maintenance of our torpedo flotilla in a satisfactory condition. As to the vessels constructed, the two battleships are of the King Edward VII. class, the Chatham ship being the *Africa*, supplied with machinery by Messrs. John Brown & Co., of Clydebank; while the Devonport vessel is the *Hibernia*, for which Messrs. Harland & Wolff, Limited, Belfast, have constructed the machinery. There are eight of these vessels which are open to criticism, owing to their possession of so many 6-inch guns. These are too large for defence against torpedo attack, and too small to be of use for long-range fighting. This is being remedied in the later ships—the Agamemnon and the Lord Nelson—to be launched from Messrs. Palmer's and Messrs. Beardmore's works respectively in the springtime. These vessels will contain ten 9.2-inch as well as four 12-inch guns, so that six of the 9.2-inch guns take the place of the ten 6-inch guns in the earlier battleships. In the *Dreadnought*, however, the intermediate caliber of gun has been entirely dispensed with, the whole of the armament being of 12-inch caliber.

The four cruisers included are: the *Warrior*, built at Pembroke, and supplied with machinery by the Wallsend Slipway & Engineering Co., Limited; the *Natal*, built and engined by Vickers Sons & Maxim, Limited; the *Cochran*, by the Fairfield Shipbuilding & Engineering Co., Limited;

and the *Achilles*, built by Sir W. G. Armstrong, Whitworth & Co., Limited, and engined by Messrs. Hawthorn, Leslie & Co., Limited. These vessels, the only ones on this year's lis designed by Sir Philip Watts, as director of naval construction, are considerable advances upon any preceding vessels, as they carry six 9.2-inch and four 7.5-inch gun.s A slight reduction in the legend speed was involved owing to this increased offensive power, but one of the ships of the class has proved so exceptionally efficient in respect of her lines and her propelers that there is no doubt that there will be no forfeiture in speed in connection with these vessels: the *Black Prince* considerably exceeded 23 knots. The scout included is the *Skirmisher*, built by Messrs. Vickers Sons & Maxim, Limited, and she will be referred to presently in connection with the steam trials of the year.

The destroyers are: Three built by Messrs. Yarrow, two by Messrs. Palmer, two by Messrs. White, of Cowes, one by Messrs. Cammell, Laird & Co., and one by Messrs. Thornycroft & Co. All are of the 25½-knot type; but the new vessels to be built for sea service are to have a speed of 33 knots, and are to be fiftted with turbine machinery.

An unusually large number of vessels have passed through their trials, and the absence of all untoward incident, as well as the satisfactory results achieved, show clearly that Sir John Durston and his staff have overcome all the difficulties incidental to the introduction of the water-tube boiler system, and to the great increase in steam pressures. That the advance has had a great influence on the efficiency of warships is proved by the fact that in only two cases amongst all the 34 vessels tried is the speed less than 23 knots, and these two are ships which were designed three or four years ago; one is a battleship of the King Edward VII. class, which had its inception in 1901, while the other exception—the second-class cruiser the *Encounter*—belongs to a class of corresponding date. In future it would seem as if 21 or 22 knots would be the speed for battleships, and, in view of this, great credit is due to the engineer-in-chief of the navy and his colleagues for the courage which has enabled them to triumph over difficulties.

In Table IV. there is set out the main results of the performance on official trial of the large ships, including one battleship, eight first-class armored cruisers, and a second-class cruiser. It will be seen that practically all these vessels have a combination of water-tube and cylindrical boilers; but the only point which need be here referred to is the marked difference in practice where the Yarrow boiler is in use. A glance at the heating and grate surfaces will show that in the Hampshire, for instance, the ratio of heating surface to grate area is 50 : 1, whereas in the other vessels it is 35 to 36 : 1. It would be interesting to determine whether in practice this greater heating surface—which is also larger in proportion to the power than in the case of the other boiler installations—has influenced economy. But it is found that in the case of the six cruisers of the Devonshire class very irregular results have been realized, notably in the second thirty-hours trial at about 70 per cent. of the total power. These vessels are alike so far as hull and engine proportions are concerned, and the variations in coal consumption are due either to the difference in the design of the steam-generator or to the personal equation. The best result, it will be seen, is got from Messrs. Beardmore's ship, the *Carnarvon*, fitted with Niclausse boilers, the rate here being 1.78 lb. per horsepower hour; while the second ship is Scotts' cruiser, the Argyll, with Babcock & Wilcox boilers. Then comes the Yarrow-boilered Elswick ship, the Hampshire. The variation in these results is almost within the margin of error, especially when it is remembered that in reckoning the power, no account is taken of the large number of auxiliary engines working on the ship. When, however, we find that in boiler installations almost exactly corresponding there is a difference of quite 10 per cent., as in the *Devonshire* and *Carnarvon*, one begins to doubt the prudence of attempting any precise deduction. Again, on the full-power trials the variance is still more marked,

and it is found that the most economical on the second 30 hours' trial becomes now practically the most expensive. As regards design of machinery, the results are certainly interesting: in all cases the water used per indicated horsepower for all purposes is given. It will be noticed that in the full-power trial the average result is about 18 lbs. At first sight this may seem large, but it must be borne in mind that in these cruisers there are in all something like 100 steam cylinders, some of them working simple and exhausting at a high pressure, and from only eight of them is indicated horsepower reckoned.

The speed attained by the vessels of the cruiser class has in all cases proved very satisfactory. The six vessels of the *Devonshire* class were fitted with propellers of different proportions and surface, and most valuable data are being collated as the result not only of the official trials, but of the quarterly tests in service, which latter are of a more searching and more suggestive character than heretofore. In recent times some propellers have greatly improved the speed for a given power, and it is not improbable that in the first ships of each class the specification will require the supplying of various propellers of different design, so as to arrive by a process of trial and error at the most suitable ratio of surface to diameter and pitch.

The full-speed performances of the six vessels of the *Devonshire* class are very striking. It will be seen that the speeds for almost the same power range between 23.63 and 23 knots, and there can be no doubt that the higher rate can easily be attained in all of the ships, provided the propellers are suitable. The Argyll was tried without having been docked for hull cleaning.

The cases of the *Duke of Edinburgh* and *Black Prince*, which are later ships, designed by Sir Philip Watts, K. C. B., are interesting, because in this case the machinery was made to standardized drawings, and gauges, templates, and jigs were made for all the working parts. These are being used also in connection with four of the ships launched this year—the *Warrior, Achilles, Natal* and *Cochran*. We should like now only to point out that although the two vessels tried were built to attain a speed of 22½ knots, the *Black Prince* has realized 23.65 knots for very little more than the designed power; and when the *Duke of Edinburgh* is fitted with the same propellers she will do equally well. This type is a distinct advance, especially in gun-power, upon the Devonshire class.

The results of the trials with the scouts are interesting because of the conditions imposed. These vessels are practically all of the same displacement, but they differ in length. The minimizing of length made it more difficult to realize the speed, but, as shown in Table V., each vessel easily exceeded the designed rate. The boilers here are all of the "express" type, and the ratio of heating to grate area is about 63 : 1, while each square foot of heating surface is called upon to produce steam for two-fifths of a horsepower. The coal consumption ranged from 2.19 lbs. to 2.67 lbs., and the speed from 25.06 to 25.88 knots. There is, however, a marked difference in the power, the two Fairfield ships getting their speed, as shown in the table, for considerably less power than others.

In Table VI. there are given the results of the official trials of the torpedo-boat destroyers. In all, sixteen vessels have been tested, and all of these are of the 25½-knot type, the intention being to ensure a larger measure of seaworthiness than in the previous ships. Since they were designed it has been shown that there was no special need for this increase in scantlings, and the Admiralty have therefore reverted to a lighter craft, in order to get a speed of 33 knots. The practice is for these vessels to run a four hours' speed trial, distinct from the coal-consumption trial, and it will be seen that the speeds vary from 26.51 knots, realized by a Yarrow boat, down to 25.51 knots. As a rule, however, the speeds averaged about 25¾ knots. The case of the Yarrow boat, the *Garry*, was particularly interesting, as the form of stern was the outcome of observations in connection with the influence of the depth of water upon the speed of such fast and light craft—*Engineering*.

TABLE IV.—RESULTS OF OFFICIAL STEAM TRIALS OF ARMORED SHIPS MADE DURING 1905.

NAME OF VESSEL.	TYPE OF SHIP.	BUILDERS OF SHIP.	MAKERS OF MACHINERY.	Displacement.	Type of Boilers.	Heating Surface	Grate Area.	First 30 Hours' Trial.				Second 30 Hours' Trial.				Eight Hours' Full-Power Trial.			
								Indicated Horse-Power.	Speed.	Coal per Indicated Horse-Power per Hour	Water, all Purposes, per I.H.P. per Hour.	Indicated Horse-Power.	Speed.	Coal per Indicated Horse-Power per Hour.	Water, all Purposes, per I.H.P. per Hour.	Indicated Horse-Power.	Speed.	Coal per Indicated Horse-Power per Hour.	Water, all Purposes, per I.H.P. per Hour.
				tons		sq. ft.	sq. ft.		knots	lb.	lb.		knots	lb.	lb.		knots	lb.	lb.
New Zealand	Battleship	Portsmouth Dockyard	Humphrys, Tennant, and Co.	16,350	Niclausse & cylindrical	45,968	1374	3979	9 log.	2	—	12.981	16.87 log.	1.83	—	18,440	18 59 M.M.	2.1	—
Carnarvon	First-class cruiser	Beardmore and Co.	Ditto	10.850	Dito	53.706	1549	4758	14.3 "	2.11	19.6	15,221	21.43 M.M.	1.78	16.84	21,464	23.30 "	2.28	21.9
Devonshire	Ditto	Chatham Yard	Thames Company	10,850	Ditto	53,866	1524	4532	13.07 "	2.05	21.4	14.853	21.07 "	2.02	19.6	21,442	22.97 "	1.79	18.9
Antrim	Ditto	J. Brown and Co.	J. Brown and Co.	10,850	Yarrow and cylindrical	58.437	1185	4098	14.46 "	2,06	18.4	14,628	21.33 "	1.95	16.48	21,604	23.02 "	2.22	18.2
Roxburgh	Ditto	London and Glasgow Co.	London and Glasgow Company	10.850	Dürr and cylindrical	53,890	1468	4635	14.38 "	2.10½	18.5	15.037	21.54 "	1.99	16.6	22,102	23.63 "	2.3	17.9
Hampshire	Ditto	Armstrong's Company	Hawthorn, Leslie, and Co.	10,850	Yarrow and cylindrical	60,129	1197	4687	14.6 "	2.02	20.4	14,445	21.47 "	1.84	17.9	21,508	23.47 "	1.87	18.8
Argyll	Ditto	Scotts' Co. Greenock	Scotts' Company, Greenock	10,850	Babcock and Wilcox and cylindrical	55,305	1504	4736	13.7 "	1.94	20.2	15,108	20.8 "	1.82	17.28	21,190	22.38 "	2.2	18.9
Duke of Edinburgh	Ditto	Pembroke Yard	Hawthorn, Leslie, and Co.	13,550	Ditto	62,651	1715	5039	14.4 "	2.2	19.8	16,908	21.1 "	1.87	18.32	22,68'	22.84 "	1.96	19.1
Black Prince	Ditto	Thames Company	Thames Company	13,550	Ditto	62,467	1780	4879	14.6 M.M.	2.11	21.1	16,699	21.51 "	1.99	19.10	23,939	23.65 "	2.1	19
Encounter	Second-class cruiser	Devonport Yard	Devonport Yard.	5,880	Dürr	34,158	903	2597	13.0 log.	1.9	17.58	9,008	18.95 "	1.98	15.49	13,006	21.03 "	2.09	16.4

M.M. = Measured Mile.

TABLE V.—RESULTS OF OFFICIAL STEAM TRIALS OF SCOUTS, 1905.

NAME OF VESSEL.	BUILDERS OF SHIP.	MAKERS OF MACHINERY.	Displacement.	Type of Boilers.	Heating Surface.	Grate Area.	96 HOURS' TRIAL.						EIGHT HOURS' FULL-POWER TRIAL		
							First 48 Hours.			Second 48 Hours.			Last 6½ Hours of Above.		
							Indicated Horse-Power.	Speed.	Coal per Indicated Horse-Power per Hour.	Indicated Horse-Power.	Speed.	Coal per Indicated Horse-Power per Hour.	Indicated Horse-Power.	Speed.	Coal per Indicated Horse-Power per Hour.
			tons		sq. ft.	sq. ft.		knots	lb.		knots	lb.		knots	
Sentinel	Vickers Sons and Maxim	Vickers Sons and Maxim	2940	Normand	44,053	715	1043	10.73	2.25	1012	10.631 (cal.)	2.37	17,488	25.07	—
Skirmisher	Ditto	Ditto	2940	Ditto	44,053	715	904	10.61	2.55	995	10.9 "	2.49	17,013	25.19	—
Pathfinder	Cammell, Laird and Co.	Cammell, Laird, and Co.	3000	Laird	43,800	657	1037	10.83	2.41	1063	10.92 "	2.35	17,176	25.34	—
Patrol	Ditto	Ditto	3000	Ditto	43,800	656	1173	10.79	2.19	1170	10.97 "	2.17	16 460	25.06	—
Forward	Fairfield Company	Fairfield Company	2945	Thornycroft	42,960	752	833	10.55	2.67	845	10.32 "	2.65	15,018	25.15	—
Foresight	Ditto	Ditto	2945	Ditto	42,960	752	808	10.53	2.59	812	10.57 "	2.5	14,277	25.12	—
Adventure	Armstrong's Company	Hawthorn, Leslie, and Co.	2940	Yarrow	42,686	784	1030	10.30	2.42	Not stated	10.24 "	2.43	15,850	25.42	—
Attentive	Ditto	Ditto	2940	Ditto	42,686	784	1105	10.32	2.34	1040	10.63 "	2.34	16,212	25.88	—

TABLE VI.—RESULTS OF OFFICIAL TRIALS OF TORPEDO-BOAT DESTROYERS, 1905.

NAME OF VESSEL.	BUILDERS OF SHIP.	MAKERS OF MACHINERY.	Displacement.	TYPE OF BOILER	Heating Surface.	Grate Area.	FOUR HOURS' SPEED TRIAL.		FOUR HOURS' COAL CONSUMPTION TRIAL.		
							Indicated Horse-Power.	Speed.	Indicated Horse-Power.	Speed.	Coal per Indicated Horse-Power per Hour.
			tons		sq. ft.	sq. ft.		knots		knots	lb.
Boyne	Hawthorn, Leslie	Hawthorn, Leslie	550	Modified Yarrow	14,852	276	7457	25.72	7106	25.40	2.31
Moy	Cammell, Laird,	Cammell, Laird, and Co.	550	Laird	14,880	233	7388	25.60	7173	25.26	2.5
Ouse	Ditto	Ditto	550	Ditto	14,880	233	7344	25.56	7304	25.33	2 65
Gala	Yarrow	Yarrow	500	Yarrow	16,000	269	7515	25.90	7592	25.49	1.91
Garry	Ditto	Ditto	500	Ditto	16,000	269	7859	26.51	7665	25.52	1.92
Swale	Palmers Company	Palmers Company	550	Reed	15,520	319	7466	25.59	7308	25.38	2.26
Ure	Ditto	Ditto	550	Ditto	15,520	319	7309	25.65	7222	25.30	2.44
Wear	Ditto	Ditto	550	Ditto	15,520	319	7294	25.62	7268	25.33	2.32
Colne	Thornycroft	Thornycroft	550	Thornycroft-Schultz	16,160	268	7884	25.57	7784	25.30	2.29
Doon	Hawthorn, Leslie	Hawthorn, Leslie	550	Yarrow	14,852	276	7358	25.80	7252	25.33	2.05
Kail	Ditto	Ditto	550	Ditto	14,852	276	7239	25.74	7310	25.39	1.91
Ness	J. S. White	J. S. White	535	White-Forster	15,640	251	7163	25.62	7112	25.27	1.95
Nith	Ditto	Ditto	535	Ditto	15,640	251	7177	25.69	7264	25.42	1.94
Chelmer	Thornycroft	Thornycroft	550	Thornycroft-Schultz	16,160	268	8034	25.70	8094	25.43	2.39
Rother	Palmers Company	Palmers Company	550	Reed	15,520	319	7213	25.51	7152	25.41	2.47
Liffey	Cammell, Laird	Cammell, Laird	550	Laird	14,880	233	7384	25.51	7391	25.30	2.68

THE DREADNOUGHT.—Few, if any, warships built in this or any country have excited the same keen and universal interest as the *Dreadnought*, which was launghed at Portsmouth Dockyard on February 10, in the presence of the King. This is due to the fact that the vessel is beyond doubt the most powerfully armed, the best protected, and the fastest battleship ever laid down. It embodies, not only in the general elements of design, but also in the details of equipment, the great experience and knowledge of strategy and tactics of Sir John Fisher, the first sea lord of the admiralty, universally regarded as the leading exponent of our naval policy. His ideas have found expression in concrete form through the co-operation of Sir Philip Watts, K. C. B., the director of naval construction, who has ever shown skill and initiatory courage, and these qualities have attained their fullest scope in the design of this new ship.

The armament calls for first attention, and, as we explained in a previous article—which contained the first information published regarding this ship, and practically all the information thus far made public—all of the ten guns of the primary armament are of the 12-inch caliber; indeed, in all the large armored ships which have recently been laid down in the British navy, this is the only gun adopted. There are many advantages to be derived from unification of caliber; the supply of ammunition at the naval bases is enormously simplified, while on board ship there is less likelihood of confusion, and a greater certainty of being able to use the best guns effectively up to the last moment of an engagement, because the remaining store of ammunition may be conveyed from one magazine to another in order to serve the gun most conveniently placed. This unification is being universally accepted, partly as a consequence of British advocacy, but mostly because of the reports by attachés present at the Battle of the Sea of Japan. There is not, however, the same general agreement as to the caliber of gun which should be adopted, owing solely to the amount of attention that must be devoted to the question of cost. Most of the Powers, however, accept the 12-inch gun, although in France there is a strong advocacy of a new 11-inch weapon, while in the new Russian cruisers the 10-inch gun is being adopted. The deficiency in caliber in the latter instances is partly compensated for by higher velocities.

Recent war experience has shown that the gunner should be able to strike any target that can be properly aimed at, or is within view; the perfection of sighting apparatus is such that these are almost synonymous terms. But it is not sufficient to merely strike the target—it must be destroyed; and to attain this object many naval officers contend that more than mere striking velocity is required. The mass of the shot counts, and therefore more destruction will be attained with a projectile of 850 lbs. weight fired from a 12-inch gun than with a 500-lb. shot from a 10-inch gun, or a 380-lb. shot from a 9.2-inch gun, even although these latter, by reason of their greater velocity, develop nominally the same striking energy. This was obvious by examination of the Russian ships sunk at Port Arthur, because the smaler shots from the 6-inch guns, and even many from the 12-inch guns, failed in what, a century ago, was termed "smashing" effect, when the old carronades were introduced. Volume in shells is also of importance for the same reason, although the destructive effect of the contents is directly relative to size. There is therefore little chance of the 12-inch gun being discarded for a lighter weapon of high velocity, even although the direct saving in weight on board ship for a pair of guns and their mountings within a barbette is between 170 and 200 tons, while the indirect saving, consequent upon a possible reduction in the dimensions of the ship and the power of machinery, is nearly threefold. The probabilities are rather in favor of even greater calibers.

There is, however, no obvious reason why the velocity of the 12-inch gun should not be increased in a way of corresponding with that of the new French 11-inch or the new Russian 10-inch guns. It is said that in the large Russian cruiser, which the Vickers Company are building, there

will be fitted 10-inch guns to attain a velocity in service of 3000 feet per second with a normal pressure in the chamber and bore. Such a velocity has only been exceeded on purely experimental trials, and has thus far not been regarded by any means as a normal condition, so that great interest will be taken in this new weapon. Looking, however, to the success hitherto of the Vickers ordinance, and to the great influence that such success has had on warship power generally, there seems no reason to expect other than a satisfactory issue from this further advance. The effect will be a development of energy in the 10-inch gun corresponding almost to that of the 40-caliber 12-inch gun; but were the same velocity applied to the 45-caliber 12-inch gun, its power would be proportionately increased. In the Dreadnought, however, the guns of 45 calibers are to have a velocity restricted to 2850 feet per second, and will give a muzzle energy of 48,000 foot-tons. These guns are being manufactured, with their mountings, by Sir W. G. Armstrong, Whitworth & Co., Limited, and Messrs. Vickers Sons & Maxim, Limited.

Up till quite recently the 12-inch gun adopted on British ships has been of only 40 calibers in length, and the velocity has been more usually 2500 feet or 2600 feet per second. Each gun of the Dreadnought will therefore be something like 30 per cent. more powerful than those fitted in ships of two years ago, double the power of the 9.2-inch gun, nearly five times the power of the 7.5-inch gun, and eight times that of the 6-inch gun. It will thus be readily understood that in offensive power the new ship is an enormous step forward. In the case of the *Royal Sovereign*, built in 1892, and with four 12-inch guns of moderate power, the collective energy at the muzzle of one round from all of the guns was only 159,619 foot-tons. The vessels of ten years later had a collective energy of 194,400 foot-tons, and in these vessels there were only four 12-inch guns, the remainder of the armament being 6-inch weapons. In the King Edward VII. class, four 9.2-inch guns took the place of some of the 6-inch quick-firers, and, as a consequence, the energy was increased to 270,000 foot-tons. In the first battleship designed by Sir Philip Watts when he returned to the admiralty—the *Lord Nelson*—all of the 6-inch guns were discarded, and the armament became four 12-inch guns with ten 9.2-inch guns; and now in the case of the Dreadnought, with ten 12-inch guns, the collective muzzle energy of one round has gone up to 480,000 foot-tons. Thus in ten years, from 1892 to 1902, there was an increase of 22 per cent., while in the past five years the advance has been 147 per cent. More important still, every shot from the *Dreadnought* will be effective at six miles range; whereas in the case of the ships of three years ago the maximum range was not more than five miles, and even then the number of shots fired within a given time was only 30 or 40 per cent. of that of the *Dreadnought*.

It is contended, however, that there is a tendency to make warships merely floating gun-carriages, and that calculations as to the collective energy of one round, and also of the weight of shot fired in a given time, are illusory. As regards the former, it may be accepted, so far, at least, as the *Dreadnought* is concerned, that the increase in gun power which we have notified has not been attained at the expense of any other quality which goes to make up fighting efficiency. The new ships will meet British admiralty conditions; but there will be a more common-sense interpretation of this phrase, and less of needless duplication. This has too often been justified as an effort to ensure reliabilty, which, after all, is only a comparative condition. The personal equation has been frequently undervalued. As to the measurement of gun power by the standard of weight of shot and collective energy per unit of time, there is no other basis embracing caliber, length, velocity and energy of gun, and the efficiency of the breech mechanism and mountings. It is true that the maximum rapidity of fire attainable may not be utilized in any engagement. A large measure of the success of the Japanese fleet was consequent upon their power of restraint, and of making sure that every shot represented value

in progress towards the destruction of the Russian ships. But it is necessary that the guns should be there, and that the mechanism and mountings should give a great rapidity of fire for any emergency requiring concentration; and the measure, under some common denominator, of each element constituting their power is as important, in estimating the design, as the horsepower of the machinery, which is not developed at all stages of the engagement.

The distribution of the armament on board the ship is equally important. The offensive power being concentrated in fewer guns, it becomes necessary that each gun should be capable of use through a wide angle; in other words, that more of the guns than hitherto should be capable of firing on either broadside. The obstruction offered by deck erections can always be minimized, but there is great difficulty in arranging magazines at the base of the gun-mountings, so as to ensure an easy and continuous flow of ammunition to the guns. In a modern high-speed battleship, however, 160 feet to 200 feet of the length of the ship is required for the machinery and coal-bunkers; and it is doubtful if the expedient of placing the magazines between the boiler-rooms is prudent, in view of temperature and possible explosions. There is consequently a strong presumption in favor of placing the guns, whose mountings are of great depth, and whose magazines require a considerable area, forward and abaft the machinery. The Italians are said to favor the fitting of six pairs of 12-inch guns in the centre line of the ship, and of placing the magazines alternately with boiler and machinery compartments. The American proposal is to fit pairs of 12-in. guns, in two barbettes at the bow and in two at the stern, all eight guns being in the center line of the ship, the inner barbettes in each case being at a higher level than those in front, so that all four guns in the forward part of the ship may fire ahead as well as on either beam, and that all four guns aft may fire astern as well as abeam. It should be stated that these guns will not be superposed, as in the case of some of the earlier American ships, but will be entirely separate. The arrangement is open to the objection that the blast from the guns in the rear pair may considerably disturb the men working the guns in front, and especially the captain at the more or less exposed firing station, while the unignited gases entering through the ventilating holes on the top of the hood may have a stupefying effect on the whole gun crew.

In the *Dreadnought* both these objections have been overcome, the arrangement which Sir John Fisher and Sir Philip Watts have devised affording the maximum of efficiency. On the forecastle there wil be mounted two 12-inch guns in a barbette, the center line being considerably above the water level. On each side, a short distance to the rear, there will be two other pairs of 12-inch guns on the upper deck level, and in order to enable these guns to fire ahead an embrasure is formed at each side of the forecastle, so that all six 12-inch guns may take part in a running fight. At the same time four of them can be used on each broadside. Aft there are two pairs of guns, both in the center line of the ship, one pair to the rear of the other; but with this difference, as compared with the American design, that both pairs of guns are on the same level and are a considerable distance apart. The four guns, therefore, cannot be fired astern, although they have a very considerable arc of training abaft and forward of the beam. Instead of placing the guns in the fore-and-aft line they might have been mounted in echelon, but the objection to this is the same as that made to the American plan. Presuming the four guns mounted in echelon to be fired on the beam, the blast and unignited gases from one pair of guns might seriously hinder the work done by the other pair. As it is, with the gun-muzzles in line, and a considerable distance apart, there is less likelihood of interference the one with the other, especially as the admiral would make it a point in his tactics to secure the weather berth. The *Dreadnought* arrangement, it is true, reduces the astern fire to two guns, which is less than in any preceding ship where

there are either 9.2-inch guns or 6-inch quick-firers on each quarter. But the pair of 12-inch guns should be adequate, in view of he other qualities of the *Dreadnought*, in comparison with probable combatants. It is not probable—at all events, for several years—that any of our possible enemies will build a ship with greater offensive power, or with more admirably distributed and effective armor protection. That being so, one is justified in assuming that the *Dreadnought* will not require to run before a superior ship. Moreover, her speed of 21 knots would probably enable her to outclass any more powerfully-armed vessel, as in most foreign powers the question of cost must militate against high speed with such gun-power. The tactics would be rather to swing the ship, so as to bring to bear upon a following enemy the whole broadside. This was undoubtedly Admiral Togo's procedure, and, as events showed, it was the correct one.

The *Dreadnought*, therefore, besides having ten 12-inch guns, will have the enormous broadside fire of eight 12-inch guns, which far excels anything in previous ships. Since the range in battleship engagements of the future is likely to be not less than five miles, and as it is essential that each shot must have a smashing effect, apart altogether from the power of penetrating armor, it may be taken that nothing less than a 10-inch gun is of any avail; so the 12-inch gun confers undoubted and necessary superiority The *Dreadnought*, even in a broadside action, is therefore equal to any two other ships afloat. None of the guns are at a less height than the upper-deck level, and the two forward barbette guns are on the forecastle. This very desirable improvement, which has been carried out in all ships since Sir Phillip Watts went to the admiralty, adds materially to the fighting efficiency, because, in a heavy sea, with the ship rolling through 20 degrees or 25 degrees, the guns formerly placed on the main deck could only be fired intermittently, owing to the disappearance of the target from the sighting position. In the new ships, with weapons on a higher plane, the captain of the gun need never lose the enemy on his sights.

Another important point in reference to the armament of the modern ship is the protection against attack by torpedo and submarine-boats. Hitherto in the British service the 12-pounder gun has been regarded as sufficient, but the surprising success of the Japanese destroyers in their recent engagements, even taking into account the preparatory work of destruction and demoralization by the battleship and armored cruiser of the previous day, has reawakened the feeling that this type of craft has great potentialities, and that a rapid-firing weapon of great power is needed to check small craft maneuvered with such daring and courage as was hown in the Sea of Japan. The 12-pounder gun has not what we have already termed a sufficient "smashing" effect. The Japanese in their new battleships have decided to fit a numerous battery of 4.7-inch guns firing 45-pound shots, and curiously enough the Russians in their new cruiser are adopting the same weapon, and are fitting over twenty of them. In the *Dreadnought* the intention is to adopt an entirely new weapon, using an 18-pound shot, and many may have doubts as to the adequacy of this new weapon, in view of the immense superiority of the vessel in every other respect.

The placing of the guns on the upper deck has materially simplified the arrangement of the armor, and here it may be interjected that the adoption of turbines has assisted towards this higher gun-platform, because the weights with turbine machinery are lower in the ship, and thus the center of gravity is considerably lower; at the same time the top hamper in the ship has been reduced. The main belt in the way of the machinery has been increased in thickness to 10 inches, and the upper deck is armored. The gun mechanism is protected by thick heavy hoods, as in the case of the earlier barbette guns; and the gun-mountings, while largely protected by the main broadside armor, are further shielded by armor barbettes or cylindrical casings.

The adoption of the steam-turbine has not only increased the speed, but

has resulted in the improvement of the maneuvering quality of the ship. Four shafts are adopted, and this has greatly facilitated the fitting of a double stern with two rudders—a form of stern advocated for some time for heavy battleships The cutting away of the deadwood in combination with a balanced rudder has improved the turning moment of later single-stern battleships by 30 per cent.; and as the double rudder enables a larger area to be utilized effectively, without increasing the torsion on the threaded shaft of the steering gear, there will be still better facility in maneuvering. While there is no change so far as the upper works are concerned, the stern of the ship is doubled under water, with two rudders quite 20 feet apart. The deadwood is cut away in each case to provide an aperture for the propeller on each of the inner shafts, while the two outer shafts project in the usual way beyond the shell of the ship some distance forward. This duplication of rudder also reduces the stress on the steering-gear. It has been found in some ships, where the one rudder is operated from the rudder-head cross-head by rods connected through nuts to a shaft with right and left-handed screw-thread, that the torsion on the shaft is very severe when the rudder is put hard over, especially when the ship is going astern at high speed. The duplication of steering-gear with two shafts will greatly reduce the stress. The steering-gear, which is of the Napier Brothers type, will be of the usual design.

The contract for the turbine machinery was placed with Messrs. Vickers Sons & Maxim, Limited, and it is anticipated that with the four propellers running at over 300 revolutions, the power developed will be equal to 23,000 indicated horsepower. There will be two high-pressure turbines and two low-pressure turbines, each on separate shafts, and each shaft will also carry an astern turbine, two of which will take high-pressure and two low-pressure steam. The high-pressure main and astern turbines are to be on the wing shaft, and the two inside shafts, in addition to carrying the low-pressure ahead and astern machines, will also have turbines of small diameter for cruising purposes. Steam for the low powers will pass from the boiler into the cruising turbines, thence to the high-pressure wing turbines, and back to the low-pressure turbine before entering the condenser. This will enable a full range of expansion to be economically attained, even with a small volume of steam.

The steam pressure is to be higher than in any previous turbine ship, as the eighteen Babcock & Wilcox boilers are to be worked at 250 lbs. pressure, which will be slightly reduced at the high-pressure turbines. The boilers, consistent with the latest practice, will be fitted for working not only with coal, but with oil fuel.

In order to reduce the power necessary to attain a speed of 21 knots, and to reduce the draught for a given displacement—the *Dreadnought* when ready for sea will be about 18,000 tons on 26 feet draft—it was decided to increase the length of the ship from the 410 feet of the *Lord Nelson* to close upon 500 feet, with a beam of 82 feet. This increase in length had the further advantage that it afforded greater room forward and aft for magazines under the 12-inch guns without interfering with the under-water torpedo-tube gear in connection with the five submerged tubes. The larger magazine will, of course, be forward, where there are six 12-inch guns.

All the executive officers will have their quarters forward. It is somewhat surprising that hitherto the admiralty have continued the location of the officers in the stern of the ship—a survival of the old-sailing-ship and paddle-steamer days—while in the merchant service the change was made thirty years ago. The conservatism which has hitherto been maintained in the service called for the isolation of the admiral in a flagship, and the commanding officer in other vessels, and this has been the excuse for placing the principal rooms at the stern, far removed from the venue of work. In most ships, even in ordinary service, the day cabin of the captain, which is under the bridge, is most frequently used, and in action the ordinary rooms of the officers would seldom be utilized.

In determining, therefore, to entirely re-arrange the habitable quarters of officers and crew the admiralty have taken a wise step. There is no reason whatever why the forecastle of the ship should not be made as attractive and as exclusive as the stern, and under ordinary steaming conditions there will be more comfort, as, even with reciprocating engines, vibration is least felt forward.

It will thus be seen that from first to last the admiralty have brought to bear upon the design of the *Dreadnought* not only a well-directed experience, but a common-sense determination to retain only those traditions of admiralty practice which improve the fighting efficiency of the ship, and not those influences and traditions which have accumulated in the hands of successive boards, who, not having the courage to prefer the modern to the old, compromised matters by adopting both. One other feature which deserves reference is the rapidity with which the ship has been constructed. Nominally, the keel was laid at the beginning of October, but a large quantity of preparatory work had been done before this.

Even so, however, it may be said that from the time when instructions were given—about seven months ago—there has been built into the ship 5500 tons of material, and it is anticipated that the progress of the machinery, guns, gun-mountings, and armor will enable the vessel to be completed and be on her trials in the early weeks of 1907. The completion, therefore, of such a vessel within eighteen months—apart altogether from the fact that a special effort has been made, and that other work may have been delayed or somewhat neglected—is a triumph of British shipbuilding which cannot be excelled, if, indeed, it can be approached, in any other country.—*Engineering.*

THE ATTENTIVE CLASS.—With the conclusion of the full-power trial of the scout *Attentive,* the whole of the new class, consisting of eight vessels of the scout type recently constructed for the navy, will have been completed. The vessels have successfully fulfilled the conditions laid down, the most important of which is undoubtedly speed. On the eight hours' full-power trial the *Attentive* attained a mean speed for the whole run of 25.88 knots, with a mean horsepower of 16,195 and mean revolutions of 257.3. Through the whole course of the trial the speed gradually increased from something over 25 knots until, during the last hour, a speed of 26¼ knots was recorded. It is therefore claimed that the *Attentive* is the fastest of the whole class, and it is believed that she is the fastest ship in the world exceeding 300 feet in length and 2000 tons displacement, the previous record over the full period of trial being held by the sister vessel, the *Adventure,* also built by Messrs. Armstrong.—*United Service Gazette.*

THE NAVAL PROGRAMME.—The admiralty have now definitely completed the contracts in connection with all the ships embraced in the naval programme for the current year. The last of the ships—three armored cruisers of the *Invincible* class—have now been ordered from Sir W. G. Armstrong, Whitworth & Co., Limited, of Newcastle-upon-Tyne, John Brown & Co., Limited, of Clydebank, and the Fairfield Shipbuilding & Engineering Co., Limited, of Glasgow. The navy estimates embraced a fourth cruiser of the same type, but it has been decided to defer the construction of this veseel. The cruisers will, we understand, be the most powerful that have yet been built, but, in conformity with the desire of the Admiralty, we refrain from giving any details. It may, however, be said that they will be fitted with turbine machinery, which is to be constructed under the Parsons patent, and that the speed to be attained will, as is also the case with the offensive and defensive qualities, excel that of any of the preceding vesels. These three vessels, with the *Dradnought,* building at the Portsmouth Dockyard, make the four armored ships which the Admiralty, in their recent exposition of naval policy, indicated as the annual instal-

ment of new work to be commenced each year. The machinery of the *Dreadnought*, as has already been indicated, is also of the Parsons type, and the contract for it has been placed with Messrs. Vickers Sons & Maxim, Limited, of Barrow-in-Furness. The other new work includes five ocean-going torpedo-boat destroyers, which, we understand, are to have a speed of 33 knots, and these have been ordered from Sir W. G. Armstrong, Whitworth & Co.; Messrs. Cammell, Laird & Co., of Birkenhead; Messrs. J. I. Thornycroft & Co., of Chiswick; Messrs. Yarrow & Co., of London; and Messrs. J. S. White & Co., of Cowes. Twelve coastal torpedo-boat destroyers were also included, and the contracts for these have been placed with the three last-named firms; five will be built by Messrs. White, five by Messrs. Thornycroft, and two by Messrs. Yarrow; while eleven new submarine boats are to be built by Messrs. Vickers Sons & Maxim, Limited, of Barrow-in-Furness. This constitutes quite a satisfactory year's programme, especially when it is borne in mind that, consistent with the strong progressive policy which has characterized Sir John Fisher's administration of naval affairs, each type of vessel will far exceed, alike in fighting power and speed, the predecessors of its respective class. Obviously the determination is that each unit of the British navy should have a considerable superiority over a prospective combatant in any "friendly" Power; and the realization of this idea could not be in better hands than those of the First Lord and the chiefs of the Technical Department at Whitehall.—*Engineering.*

COASTAL DESTROYERS.—H. M. S. *Cricket*, the first of the new coastal torpedo-boat destroyers built for the Admiralty under the 1905-6 naval programme, was launched from Messrs. White's yard at Cowes last week. The vessel has many important improvements, will burn oil fuel only, and her turbine engines will possess increased power for going astern, making her much more handy than vessels with this means of propulsion usually are. She is to travel at 26 knots.—*Page's Weekly*

OCEAN-GOING DESTROYERS.—The five new ocean-going destroyers provided for in the naval programme for 1905-6 are to have displacements varying from 775 tons to 810 tons. The *Cossack*, building by Messrs. Cammell, Laird & Co., of Birkenhead, and the *Ghurka* by Messrs. Hawthorn, Leslie & Co., of Newcastle-on-Tyne, are each to be of 810 tons—the same displacement as the torpedo gunboats of the *Jason* type, and 220 tons in excess of the torpedo-boat destroyers of the *Garry* class, which are the largest afloat. The *Afridi*, building by Messrs. Armstrong Mitchell & Co., will have a displacement of 795 tons; the *Tartar*, by Messrs. Thornycroft & Co., 785 tons; and the *Mohawk*, by Messrs. J. S. White & Co., of Cowes, 775 tons. The destroyers will be fitted with turbine machinery, but no announcement has been made as to the power and speed, although it is believed they are to steam 33 knots.—*United Service Gazette.*

CASUALTIES IN 1904.—The recently-issued return of the casualties to ships of the Royal navy, during 1904, is interesting for its contrasts to the drastic action taken recently by the Admiralty in relation to the grounding of the *Assistance*. By last year's accidents 43 persons lost their lives and 36 were injured. The most serious was the loss of 11 lives through the sinking of Submarine A1, by the *Berwick Castle* on March 18. Eighteen battleships, 22 cruisers and 67 torpedo-boats and destroyers are mentioned in the year's accidents. The constant activity and high speed of the destroyers and torpedo-boats make every page of this Admiralty return bristle with records of collisions by these vessels, either with each other or with obstructions of different kinds. One destroyer, the *Vixen*, was particularly unfortunate, having four casualties. "Inexperience of lieutenant in command" is set down as the cause of collisions due to the *Skate*, the *Vixen* and torpedo-boats 108 and 112. "Errors of judgment" by sub-lieutenants or lieutenants in command are also recorded, but very few punishments appear in the report.—*United Service Gazette.*

HEALTH OF THE NAVY IN 1904.—The Statistical Report on the Health of the Navy in 1904 has just been issued in the form of a blue-book. The returns for the total force serving afloat may be considered to be very satisfactory. With a personnel increased by 7,470 over the previous year, there are decreases in the ratios of cases, invalidings and deaths as compared with the average of the last seven years, while the ratio of cases per 1000 of force shows a reduction on all the same period. The invaliding ratio of the total force, viz., 22.7 per 1000, shows a decrease of 7.28. As regards the death rate the ratio per 1000 was 4.45, showing a decrease of 1.01 per 1000. The highest invaliding and death rates were on the East Indies station. The total number of deaths was 493, of which 348 were from disease and 145 from injury.—*United Service Gazette.*

ENGINE-ROOM MISHAPS.—The Admiralty have just issued a circular letter dealing with engine-room mishaps, such as have unfortunately been somewhat prevalent recently. It is unnecessary to specify the cases we have in mind, but these must be well known to most naval officers. It is true, of course, that the responsibility may in some instances rest with people outside the ship, but in others it has been unquestionably due to matters which might have been remedied by those on board. It is considered that the mishaps have been due to lack of experience of high-speed running on the part of the engine-room complement, through the quarterly trials ordered by the regulations not being carried out as regularly as is desirable. These trials are of special importance, their object being to ensure not only that the machinery is kept in an efficient condition in the ships in full commission, but also that the engine-room complements of newly commissioned ships shall have every opportunity of working the engines at high speed. Where it is found impossible to carry out the trials during the quarter the report called for in the regulations is to be sent in without delay, and special arrangements will, so far as the exigencies of the service permit, be made for the vessels to proceed to sea for the purpose of carrying out the trials. Further, in new ships just commissioned, it is recommended that before making the first quarterly passage trial, a short preliminary run should be made, at such speed as the commanding officer shall deem advisable, to ensure satisfactory adjustments of the bearing for high speed.—*Army and Navy Gazette.*

The Admiralty have notified in a circular letter, dated October 20, 1905, that, in view of the recent changes in the constitution of His Majesty's fleet, it has been decided to abolish the qualifications of lieutenants G marked star in navy list and lieutenants T marked star, and to combine the first and second courses for gunnery and torpedo lieutenants into one course for each class of officer, and these courses for lieutenants G and T are to consist of 52 weeks respectively. The advanced course for lieutenants G marked with dagger and T marked with dagger will remain as at present. Requalifications of gunnery and torpedo lieutenants will only take place at the gunnery and torpedo schools at Portsmouth.—*United Service Gazette.*

MANEUVERS FOR 1906.—The great programme of naval maneuvers for 1906, which has been planned by Admiral of the Fleet, Sir John Fisher, has begun. More than 100 scouts, destroyers and torpedo-boats will take part in attack and defence round the coast, and the coastguard stations will be mobilized as on a war footing. In February the vessels of the Channel, Atlantic and Mediterranean fleets, to the number of 58 battleships and cruisers, will assemble at Lagos under the command of Admiral Sir Arthur Wilson, V. C. This will be the largest fleet that has ever assembled for maneuvers, and in June the exercises will be repeated on an extended scale. The warships in the Southern seas and the Pacific will have maneuvers in September. The year's programme is the most extensive in the history of naval training, for practically the entire British Navy will be

on a war footing. The new system of distribution will be tested in every link. The work will be carried out under the assumption that war has broken out and the Colonies and sea-borne commerce need protection from the fleets at sea.—*United Service Gazette.*

The world-wide maneuvers which the British navy will engage in during June next, are to be made memorable from the fact that the Admiralty are inviting the co-operation of British shipowners, to arrive at a practical scheme for the protection of Brtish commerce during war time. For this purpose the Admiralty seek to have vessels trading in the principal maneuver area, which will extend from the English Channel to Gibraltar and half-way across the Atlantic, placed under naval command for a period of about a week. During that time it is proposed that the maneuvers will comprise the attack and defence of vessels sailing under the flag of the British mercantile marine. Passenger vessels, mail steamers and ships carrying live stock are to be excluded from the scope of the proposed maneuvers, while the Admiralty undertake to pay a satisfactory compensation for any vessel a warship may "hold up" in the carrying out of the maneuver programme. Negotiations are still in progress but there is every prospect that shipowners will endeavor to fall into line with the Admiralty in carrying out the desired arrangements.—*United Service Gazette.*

Several announcements of an official nature have been made recently which possess an interest somewhat wider than that which naturally pertains to them as affecting the existing organization of the navy. The use of the instrument which has been from time immemorial an emblem of office in the navy, as well as serving a more utilitarian purpose—the "call" or "pipe" whistle mainly associated with the boatswain and his mates—is to be revived. Its origin and the reason for its peculiar shape cannot now be traced, but it was certainly at one time worn as a badge of office by the admirals of the fleet. On the day of the great fight in Conquet Bay in April 1513, Sir Edward Howard, in the *Sovereign*, when he found that he was overpowered, "took his chain of gold nobles from about his neck, and his great gold whistle, the ensign of his office, and threw them into the sea, to prevent the enemy from possessing the spoils of an English admiral." In recent times it has fallen into disuse, having been superseded by the bugle, but now pipes or calls are being supplied to the different fleets in order to discover the most suitable type, as well as to enable systematic instruction in their use to be given to the petty officers and boys. It is a pity, seeing what its association has been, and its peculiar appearance, that it should not be made again part of the officer's uniform, and perhaps, attached to the aiguillettes, a badge of office for the staff. Another order abolishes the custom of the daily levées or "readings," which have been held in the dockyard at the office of the admiral superintendent of the Admiralty inspections, at one time a very important annual institution, have lost their original purpose and value owing to the introduction of improved methods of communication and means of transit. Another order appears to indicate that the coastguard is on the point of extinction. The original purpose of this institution, which was not that of a preventive service, but a reserve of men for the fleet, has been largely superseded by other systems and methods, and after various transitory stages of reorganization may well disappear in its present form. The order states that as there are already enough candidates to fill vacancies for some time to come, no further applications for entry are to be forwarded except in the case of signal ratings.—*Army and Navy Gazette.*

The concentration of the Channel, Atlantic and Mediterranean fleets with the first, second and third cruiser squadrons off the western coast of Portugal, will shortly be effected under Admiral Sir A. K. Wilson, for the purpose of joint tactical exercises. According to the *Morning Post*, the most striking feature in these three fleets and three squadrons is the great care which has been taken in their organization. The arrangement of the

Channel and the Atlantic in two homogeneous divisions, the complete homogeneity of the Mediterranean, and the exclusion from the cruiser squadrons of all vessels with less than 22 knots speed ensure that an officer who has the responsibility of directing such an immense force against an enemy will be able to derive the utmost advantage from the special qualities of each of its component parts. Its strength may be judged from the following summary of its gun-power:

Guns.	Channel.	Atlantic.	Mediter'an.	Cruiser Squadrons.			Total.
				1st	2nd	3rd	
12-inch	52	32	32	—	—	—	116
10-inch	4	—	—	—	—	—	4
9.2-inch	—	20	—	2	2	2	26
7.5-inch	14	—	—	20	—	4	38
6-inch	156	80	96	46	86	50	514

The potentiality of a force thus armed can be realized by comparing these figures with the armament of the two contending fleets at the Battle of Tsu-shima. Reckoning 10-inch and upwards as heavy guns, and all weapons from 4.7-inch to 10-inch as medium, the following is the result:

	Japanese Fleet	Russian Fleet	Total Ar'ment	Total Ar'ment Adm. Wilsons' Forces
Heavy	17	41	58	120
Medium	110	59	169	578

Page's Weekly.

ITALY.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Roma	12,625	Gov't Yard, Spezia.	Building.
Napoli.....	12,625	" " Naples.	Launched Sept. 10, 1905.
Vittorio Emanuele ..	12,625	" " Castellamare.	" October 1, 1904.
Regina Elena.....	12,625	" " Spezia.	" June 19, 1904.
Armored Cruiser.			
San Giorgio	10,000	Gov't Yard, Castellamare.	Building.
San Marco	10,000	" "	"
Pisa	10,000	.....	Projected.
Amalfi	10,000	.....	"

The proposals for the Italian Naval Budget of 1906-7 do not vary the incidence of the law of July, 1905, which determined the amount of this budget for the period 1905-1917, fixing it at 133,054,000 lire, but add to it a sum of 12,000,000 lire. In the course of the year the battleships *Vittorio Emanuele* and *Regina Elena* are to be completed and added to the fleet. Work will be continued upon the *Roma* and *Napoli*, the armored cruisers *San Giorgio* and *B*, the blockading vessel laid down at Venice, the four submersibles *Squalo, Narvalo, Otario and Tricheco, as* well as twenty-five first-class torpedo boats of various types, two gunboats for the lakes, four tugs and some other vessels.—*Army and Navy Gazette.*

JAPAN.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Kashima	16,500	Elswick.	Launched Mar. 22, 1906.
Katori	16,500	Vickers.	" July 4, 1906.
Satsuma	18,000	Yokosuka.	Building.
Aki	18,000	Kure.	Projected.
Armored Cruisers.			
Ikoma	14,000	Kure.	Building.
Tsukuba	14,000	"	Launched Dec. 28, 1905.
Ibuki	14,000	"	Building
Kurama	14,000	Yokosuka.	"
Protected Cruisers.			
Tone	3,050	Sasebo	Building

WAR VESSELS BUILDING IN JAPAN.—From one of the newspapers just to hand from Japan, we learn that the following is the list of war vessels building, or about to be laid down, in the dockyards of that country:

At Kure, the battleship *Aki* (18,000 tons), about to be laid down.

At Yokosuka, the battleship *Satsuma* (18,000 tons), about to be laid down.

At Kure, the armored cruiser *Tsukuba* (14,000 tons), laid down in February, 1905, and expected to be launched in February, 1906.

At Kure, the armored cruiser *Ikoma* (14,000 tons), laid down in December, 1904, and expected to be launched in December, 1905.

At Yokosuka, the armored cruiser *Kurama* (14,000 tons), laid down, but dates are not given.

At Kure, the armored cruiser *Ibuki* (14,000 tons), about to be laid down.

The *Jiji Shimpo*, referring to this subject, says that the Japanese Admiralty has already elaborated a scheme of naval expansion which awaits the approval of the Diet. Although Japan has now a fairly large and efficient navy, it is recognized that some of her best ships are beginning to be out of date, and everything goes to indicate the necessity of building larger ships, with much heavier armaments and higher speed. The *Jiji* says: "England is now building the *Lord Nelson*, a battleship with a displacement of 18,000 tons, and an armament of four 12-inch guns; but English naval architects contemplate something much more formidable. Russia's new navy will certainly be on modern models, and Japan must live up to the time." We are informed that the new submarines, five in number, when performing evolutions before the Emperor at the naval review, proved a great success, and the authorities are about to increase the squadron. The Japanese believe that the submarine is especially suitable for their navy, as its management demands precisely the qualities in which the Japanese officer and sailor excel, courage which never shrinks from self-sacrifice and absolute coolness in action. The destroyer *Asakaze* was launched at the Kawasaki yard, in Kobe, at the end of October, in the presence of a large company, and Captain Ommaney, of H. M. S. *Andromeda*, cut the rope freeing the vessel. The *Asakaze* is one of five destroyers ordered by the Admiralty from this same firm. We learn further that a new factory for large guns is nearly completed in the neighborhood of Tokio, midway between Oji and Itabashi, covering an area of 100,000 tsubo (83 acres). It is said to be very complete in every department and fitted with the most improved appliances. Much energy has been shown in pushing on the work. Four thousand men are said to have been employed originally, but the number is now reduced to seventeen or eighteen hundred. The cost is put at two million yen, and the shops are now about ready to begin operations. It is quite evident that the Japanese are determined to

maintain all the advantages they have gained. It is, however, to be regretted that political conditions should have forced them into the course of militarism instead of the peaceful development of the resources of their country.—*Engineering.*

The largest warship ever built in Japan was successfully launched at Tokio, December 26, 1905. She is the armored cruiser *Tsukuba,* and is 440 feet long, 75 feet beam and 25 feet draft. Her tonnage is 13,750, and her engines are 20,500 horsepower. She was less than a year in building, having been laid down January 14, 1905. The destroyer Harikino, 480 tons and 600 horsepower, was launched at Kobe December 25.—*Nautical Gazette.*

The armament of the *Tsukuba* is still unknown, but it is believed to be four 10-inch and twelve 8-inch guns, and the United States cruiser *Washington* is understood to be the model. Other surmises—for they are nothing more—credit her with being very like our *Minotaur* class—the four heavy guns coupled, and the 8-inch guns in small single turrets along the upper deck. Yet a third rumor gives the ship six 12-inch guns, disposed one forward, one aft, and four at the angles of the superstructure—much, that is to say, as our *Black Prince,* with the 6-inch guns omitted, and 12-inch in place of the 9.2's A fourth story is to the effect that the *Tsukuba* is a *Vittor Emanuele,* with two 12-inch guns, disposed exactly as in Colonel Cuniberti's famous ship. This last, perhaps, may be the most correct surmise, as the Japanese are great admirers of Colonel Cuniberti, and the *Vittor Emanuele,* though of small account as a battleship, is ideal as an armored cruiser.—*Engineer.*

RUSSIA.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Emperor Paul I.....	16,000	St. Petersburg (Baltic Yard).	Building.
Andrei Pervosvannui.....	16,000	St. Petersburg (Galerney Island).	Launched May, 1905.
Slava.....	13,516	St. Petersburg.	" Aug. 29, 1903.
Evstafi.....	12,500	Nicolaiev.	Building.
Ivan Zlatoust.....	12,500	Sevastopol.	"
Armored Cruisers.			
Admiral Makaroff.....	7,200	La Seyne.	Building.
Bayan.....	7,200	St. Petersburg	"
X.....	7,200	.....	"
X.....	7,200	.....	"
Protected Cruisers.			
Kagul	6,750	Nicolaiev.	Building.
Otchakof.....	6,750	Sevastopol.	Under trial.
Vitiaz	6,750	St. Petersburg.	Building.
Rurik	15 000	Vickers.	"
X.....	15,000	"	"

The Russian cruiser *Admiral Makaroff,* which is being built by the Forges et Chantiers de la Mediterranée, at La Seyne, France, is so far advanced that she will be ready for launching next spring, says the *Kronstadtski Viestnik.* At the same yards has been recently finished the Russian torpedo-boat destroyer *Isukusni.* Her delivery trials at full 20-knot speed were considered quite satisfactory. Three others of the same type by the same builders have already completed their delivery trials. Four others are lying at Havre, where they have been built, and are now awaiting their trials. The length of each of these eight boats is 185.37 feet; beam, 21 feet; draft, 13.45 feet; armament, one 2.95-inch and five 1.85-inch guns, and two 17.7-inch torpedo tubes. There are also four other Russian torpedo-boat destroyers built or building at Havre, of the French *Framée* type.

The prize for a design of a Russian battleship, in a competition opened early in the year by the Imperial Russian Technical Society, has been awarded to Naval Engineer Achenbach for a battleship of 13,000 tons with turbines, and armed with ten 12-inch guns disposed so as to be capable of being fired broadside to the number of eight, and fore and aft to the number of four.—*Nautical Gazette.*

The *Moniteur de la Flotte* states that in August, 1904, the Russian Admiralty ordered, at the Forges et Chantiers de la Méditerranée, and at Havre, eleven destroyers of 336 tons and twenty-six knots speed, 185 feet 9 inches long, and with 21 feet beam. Each was to be supplied with four Normand boilers, and two triple-expansion engines The armament was to be one 12-pr. and five 3-prs., besides two machine guns and two torpedo tubes. The construction has been directed to making these boats perfectly robust and suitable for work in all weathers. Four of them have been built at La Seyne and seven a Havre, four of the latter at Graville, and three at the Normand Yard. After the conclusion of peace the Russian Government appointed a committee to supervise the trials of the boats. At the beginning of January four boats from La Seyne and four from Havre had been accepted and received in the best condition, the speed of 26 knots having been largely exceeded, and some of the boats having steamed at more than 27 knots. The company of the Forges et Chantiers de la Méditerranée had charge of the boats to Libau, where the *Moniteur* says that five of them have already arrived. They navigated the Baltic in rough weather and were in perfect condition.—*Army and Navy Gazette.*

UNITED STATES.

VESSELS BUILDING.

No.	Name.	Speed. Knots.	Where Building.	Per cent completed Dec 1, 1905.	Per cent completed Mar. 1, 1906.
	Battleships.				
13	Virginia	19	Newport News.	97.	99.
14	Nebraska	19	Moran Bros. Co.	83.	90.
15	Georgia	19	Bath Iron Works.	90.2	94.6
16	New Jersey	19	Fore River Shipbl'g Co.	93.7	97.5
17	Rhode Island	19	Fore River Shipbl'g Co.	98.	100.
18	Connecticut	18	Navy Yard, New York.	92.7	96.1
19	Louisiana	18	Newport News.	92.6	97.2
20	Vermont	18	Fore River Shipbl'g Co.	68.7	76.3
21	Kansas	18	New York S. B. Co.	67.7	74.2
22	Minnesota	18	Newport News.	77.1	83.5
23	Mississippi	17	Wm. Cramp & Sons.	45.7	51.2
24	Idaho	17	Wm. Cramp & Sons.	42.6	49.2
25	New Hampshire	18	New York Shipbl'g Co.	29.2	39.3
	Armored Cruisers.				
6	California	22	Union Iron Works.	86.2	90.
9	South Dakota	22	Union Iron Works.	84.9	89.1
10	Tennessee	22	Wm. Cramp & Sons.	90.	94.5
11	Washington	22	New York Shipbl'g Co.	89.4	95.5
12	North Carolina	22	Newport News.	26.8	37.
13	Montana	22	Newport News.	22.3	32.4
	Protected Cruisers.				
20	St. Louis	22	Neafie & Levy Co.	83.6	90.6
21	Milwaukee	22	Union Iron Works.	86.	90.9
	Scout Cruisers.				
	Chester		Bath Iron Works	13.3	22.2
	Birmingham		Fore River Shipbl'g Co.	15.4	24.5
	Salem		Fore River Shipbl'g Co.	14.8	24.9

$252,272,667 COST OF THE NEW NAVY.—According to a compilation made by Pitman Pulsifer, clerk of the Senate Committee on Naval Affairs, the United States has spent on its new navy, which comprises all boats which have been constructed since 1883, $252,272,667.21.

Mr. Pulsifer has computed the cost of maintenance each year, of each type of vessel, and his results are given in this table, which includes expenditures for pay of officers and repairs to the vessels:

Type of vessel.	Expense.
First-class battleship	$634,255.54
Second-class battleship	468,729.31
Armored cruiser	489,206.27
Protected cruiser	395,624.97
Monitor	209,273.56
Gunboat (1710 tons)	175,420.43
Gunboat (1177 tons)	133,314.46
Gunboat (1000 tons)	117,860.89
Torpedo-boat destroyer	81,674.90
Torpedo boat (estimated)	34,000.00
Submarine torpedo-boat	29,879.36

To operate each of these types Mr. Pulsifer gives this table of officers and men:

Vessel.	Officers.	Men.
First-class battleship *Connecticut* (16,000 tons, under construction)	41	840
Maine (12,500 tons)	35	772
Second-class battleship *Texas* (6315 tons)	30	473
Armored cruiser *New York* (8150 tons)	34	535
Protected cruiser *Olympia* (5865 tons)	30	454
Monitor *Nevada* (3225 tons)	13	209
Gunboat *Bennington* (1710 tons)	11	194
Machias (1177 tons)	9	136
Annapolis (1000 tons)	11	149
Torpedo-boat destroyer *Lawrence* (446 tons)	3	74
Torpedo-boat *Dahlgren* (146 tons)	2	26
Submarine boat *Holland*	1	11

Ships and tonnage of the navies of the world are reported by Mr. Pulsifer to be:

Country.	Ships.	Tonnage.
United States	158	701,797
Great Britain	497	1,907,998
France	533	800,958
Germany	222	588,062
Japan	190	427,871
Russia	237	375,695
Italy	190	340,428
Austria	64	143,956

The ships building by the various nations are given in tonnage as: United States, 384,780; Great Britain, 298,740; France, 181,928; Germany, 123,330; Japan, 106,860.—*Nautical Gazette.*

ORDNANCE AND GUNNERY, TORPEDOES.

NAVAL GUNNERY RESULTS.—In pursuance of their scheme for encouraging gunnery in the navy, the Admiralty have issued in the form of a Blue Book the result of the test of gunlayers in the fleet during the year 1905. In a Minute circulated for general information under date December 12

the board state: "Their Lordships note with much satisfaction the great improvement in the results as compared to former years. The conditions under which the practice took place were different to those of 1904, the range being shortened to that in use in 1903 and previous years, the target being smaller than that used in 1904, and reduced also as compared to the target in use in 1903 and previous years as regards 9.2-inch guns and above. The award of the medal will be promulgated in due course."

Order of Merit.	Fleet or Squadron.	No. of Ships.	No. of men firing.	Points per man	First Ship in Fleet.	Scores.
1	Atlantic,	15	211	76.01	Illustrious,	108.87
2	3d Cruiser,	4	52	75.43	Leviathan,	105.38
3	Channel,	14	188	74.64	Exmouth,	127.78
4	2d Cruiser,	6	78	69.05	Berwick,	87.64
5	Mediterranean,	12	147	68.52	Bulwark,	114.04
6	East Indies,	5	43	66.66	Perseus,	100.09
7	China,	14	162	65.05	Iphigenia,	91.40
8	Cape of Good Hope,	4	38	64.14	Pelorus,	74.58
9	1st Cruiser,	6	72	61.63	Monmouth,	81.49
10	Australia,	5	47	55.27	Pegasus,	74.58
11	N. America & W. Indies,	4	36	53.04	Diamond,	68.03
12	Tenders,	11	22	26.12	Skipjack,	52.92
		100	1,096	68.26		

—*United Service Gazette.*

The gunnery results achieved in the navy during the past year are of a remarkable character calling for comment in at least two directions. On the one hand we have a very marked improvement in the records of the Channel, Atlantic and Mediterranean fleets under Admirals Sir A. K. Wilson, Sir W. H. May and Lord Charles Beresford, while in the case of almost all the squadrons stationed in more distant seas the returns have suffered heavily by comparison. The four ships heading the gunnery list are respectively the *Exmouth*, 374.8 points; *Queen*, 322.2; *Leviathan*, 268.8; and *King Edward VII.*, 261.4. The new return of the order of the fleets and squadrons in battle practice is as follows:

Order of Merit.	Squadron.	No. of Ships.	No. of Guns.	Average Points.
1	Channel	12	182	157.0
2	3d Cruiser	4	56	147.9
3	Mediterranean	12	177	133.1
4	Atlantic	11	176	91.8
5	China	8	112	65.3
6	2d Cruiser	6	88	54.0
7	1st Cruiser	6	76	47.5
8	Australia	1	14	46.8
9	East Indies	4	37	37.6
10	Cape of Good Hope	4	39	31.6
		68	957	120.0

—*Page's Weekly.*

THE NAVAL GUNLAYERS.—The important Return giving the results of the gunlayers' tests which has been published this week will be read with the greatest interest throughout the Service. It does not appear at present to have attracted as much attention as it deserves, but we may be quite sure that its figures will be noted in every foreign naval bureau. The net result of the tests is as the Lords of the Admiralty say in their circular, satisfactory; at the same time there are some unsatisfactory features which

cannot escape notice. It is highly satisfactory that there should be such a marked improvement as these returns show, not only in the firing of individual, but in the general average attained by the fleet. A comparison with the results of last year's competition, which were published in May of this year, are affected by the circumstance that in 1905 the size of the target and the range were altered; as, however, the target now used is but little more than half the size of that used in 1904, this difference tells for and not against the marksmanship displayed in the recent tests. It is a matter of congratulation, therefore, both for the Service and for the nation, that the average number of points per man which stood in 1904 at 43.22 should now have risen to 68.26, and that the number of ships which made scores over and above the average is only eight short of half those which competed.

The other and the disapopinting side of the return is to be found in the very poor show made by the greater number of ships that are below the average. We noticed not long since the demand by a daily paper that the captain of every ship failing to attain to a reasonable standard of gunnery efficiency should be superseded, and this is an indication of the way in which the matter is regarded in certain quarters. The imposition of such a penalty appears to us far too harsh a measure, but at the same time, it is apparent from this return that there are some officers who have not yet thoroughly realized the essential need for reformation in this respect. By no reason easy to discover can be explained the wide difference to be found between the scores. The *Exmouth*, for example, makes 127.78 points, while the *Jason* makes nothing at all On the face of it, there does not seem any reason why the *Jason* should not have done as well as the *Skipjack*, which made a score of 52.9, or the *Halcyon* with 45.36. Nor for the matter of that why the *Albion* should only make a score of 44.55, while the *Ocean* has a score of 84.79. The *Implacable* again has a score of 45.05 while the *Bulwark*, of the same class in the same fleet, shows 114.04 points. A similar difference is found between the scores of the *Leviathan* with 105.38 points and the *Good Hope* with 59.35 points; between those of the *Berwick* with 87.64 points and the *Essex* with 41.51 points, and the scores of the *Perseus* with 100.09 points and the *Prometheus* with 21.59. There is surely something here which requires investigation

It may be assumed that these differences, which are shown in the total number of points, are not borne out when the shooting with certain guns is examined. But this is not so. For while the *Bulwark*, with her 12-inch guns, makes 124.87, the *Albion* and the *Magnificent*, with similar guns, can only make 7 points each, and there are other differences quite as striking in the firing with guns of this nature Quite as wide a gap occurs between the best and the worst firing made with the 6-inch pieces. Here the *Exmouth* is the top with 136.84 points, and the *Scylla* and the *Sappho* are at the bottom with no hits at all. With the 9.2-inch gun the ships above the average are the *King Edward VII.*, the *Sutlej*, the *Leviathan*, the *Hindustan*, and the *New Zealand*, while those below are the *Hogue*, *Good Hope*, *Drake*, *Euryalus*, *Dominion* and *Commonwealth*. The best shot in the fleet is T. Palfreyman, gunner of the R. M. A. in the *Exmouth*, who scored 184 points, and next to him come J. Walker, leading seaman, and Sergeant G. Boyce, R. M. L. I., with 174 each. The next are P. O.'s H. Penford, S. Hayward, A. Taylor, W. Thomson, R. Ansell, with H. Rivers, gunner R. M. A., scoring 166 points each. Next again come Leading Seaman G. Barber, W Keats, A B., Leading Seaman F. Harrison, M Waugh, A. B., and J. Morrison, A. B., with 157 points apiece. Following these are Gunner J. Carter, R. M. A., Leading Seaman A. Morand and P. O. A. Gass with 156, while there are also eleven others who scored 147 each.

The Atlantic fleet maintains its position at the top of the list, with the *Illustrious* as first ship The third cruiser squadron, that in the Mediterranean, comes second, the *Leviathan* leading, and the Channel fleet, which last year as the home fleet stood tenth on the list, has now gone up into third place. The Mediterranean fleet, on the other hand, which was second

last year, has dropped to the fifth place and there are other changes of a like nature. In every case these changes are due to what we may call the tail of the squadron, the bad ships which nullify the efforts of the leaders. Now that the relative positions of the various fleets and squadrons was made public, there can be no doubt that every effort will be made to retrieve ground that has been lost. The spirit of emulation has been aroused, and we have no doubt that the Admiralty will make it clear that they will encourage those who have shown that they recognize their responsibility for efficient marksmanship, and have made use of the opportunities given them.—*Army and Navy Gazette.*

The Admiralty have adopted an excellent system for showing the gunnery practice of the fleet at a glance. The battle practice and gunlayers' tests for the past year have been issued on a single sheet, so that it may be posted in a convenient place on board every ship. This is an entirely new departure on the part of the naval authorities, and is calculated to have a very beneficial effect on the naval service.

The following abstract shows the position of the squadrons, the numbers being the order of merit in each practice:

Squadron.	Battle Practice.	Heavy Gunlayers' Test.	Light Q. F. Gunlayers' Test. 12-pdrs.	6 & 3pdrs.
Channel	1	3	2	4
Atlantic	4	1	7	2
Mediterranean	3	5	4	6
3rd Cruiser	2	2	5	1
2nd Cruiser	6	4	8	9
1st Cruiser	7	9	6	7
China	5	7	9	11
Australia	8	10	3	3
East Indies	9	6	1	5
Cape of Good Hope	10	8	—	10

The new methods employed have been successful, and the general state of the navy in gunnery is most highly creditable to Admiral of the Fleet Sir John Fisher, Rear-Admiral Percy Scott, the director of target practice, Captain Jellicoe, the director of naval ordnance, and the flag officers afloat.—*United Service Gazette.*

BATTLE PRACTICE OF DESTROYERS.—The Admiralty have just issued a circular letter in reference to the battle practice of the torpedo-boat destroyer flotilla, which is of particular interest in view of the criticisms of the results of the gunlayer's tests which have appeared in various quarters. The results obtained by the 6-pr. guns of the destroyers during the battle practice last year were unsatisfactory, and during the coming year it has, therefore, been decided that the annual practice allowance of ammunition for these guns shall be doubled. We are not in a position, of course, to judge of the actual results of the battle practice, such information being confidential. But from the fact that in future eighty rounds of ammunition per gun will be allowed to each vessel, it seems permissible to assume that the work done in 1905 showed lack of experience in the working of these guns. In future, moreover, all misfires, delays and failures to fire are to be included in the commanding officer's report of the battle practice of his ship, and this is a measure which will recommend itself to all naval

officers. The object of all battle practice is training for actual warfare, and the gunnery efficiency of the fleet is judged by the battle practice of each year. The commanding officers of destroyers are therefore recommended to exercise the utmost care in supervising the target practic of their respective vessels, and to bear in mind the object of the work in hand. In the German press there have been some very strong criticisms of the recently published return of the gunlayers' tests, but the writers of these articles appear to be under the impression that these tests are the same as the battle practice. The fact that this is not the case removes a good deal of the cause of the criticism, but the remarks upon the subject made by the *Hamburger Nachrichten* and other journals are instructive.—*Army and Navy Gazette.*

IMPROVISED FITTINGS FOR GUNS.—The question of the use of improvised and non-service fittings with guns having been under consideration, the Admiralty have directed that in future a loading tray is not to be used with heavy quick-firing guns, since it has been found that its use is liable to cause serious hang fires. The practice of allowing the breech number to keep his hand on the breech mechanism lever during firing is considered dangerous, and is to be discontinued.—*United Service Gazette.*

A NEW TARGET.—Rear-Admiral Percy Scott, who has returned home from the Mediterranean, on the completion of his inspection of the battle practice of the fleet on that station, has had in use a new service target. The new pattern has proved a great success, as it cannot be shot away or materially reduced in size during practice. It is constructed of a great many masts, connected with smaller woodwork, and covered by canvas, which is stretched nearly 130 feet. The canvas, being held to a trellis-work frame, does not have its area reduced by the action of the wind blowing it like a sail.—*United Service Gazette.*

A valuable invention for improving prize firing is said to have been discovered in the Atlantic fleet. It consists in using an extra large target, so as to secure as hits what would otherwise be misses. The regulation target is 88 feet by 24½ feet; the new "many hit" type is 90 feet long by 30 feet high. The extra height is what catches the misses. However, it may be pointed out that 30 feet is the average height of a battleship when due allowance is made for her 75 feet beam. Up to 24½ feet will hit the side, the next five feet over will fall on the deck, with presumably very unpleasant results But it is obvious that hits in the water-line section are considerably more valuable. This section may be reckoned as the lowest four feet. Striking it is, of course, pure chance.

The 12-inch hits secured by the Atlantic fleet were:

Hindustan	13	out of	25	rounds.
New Zealand	10	"	18	"
Commonwealth	9	"	19	"
Dominion	2	"	14	"

It is interesting to note that the ships which fired fastest got the best number of hits—roughly 52 per cent.

Hits secured by the Mediterranean fleet were—with 12-inch: *Bulwark*, 9; *Prince of Wales*, 4; *Formidable*, 2; *Irresistible*, 3. The Bulwark is familiarly known in the Mediterranean as the *"Rooshian."—Engineering.*

Some important gunnery experiments are being carried out at Shoeburyness with the obsolete destroyer *Skate*. At present torpedo craft do not carry any armor protection against the guns of a warship, and it is thought that a destroyer suitably armored cannot be prevented from closing on a battleship The *Skate* has been built for this test, and heavy guns have battered at her while stationary, with results which are as yet inconclusive, as moving target trials are yet to take place. The result of the

test, it is remarked, may be the creation of a new but slower type of destroyer more deadly in purpose than the present class.—*United Service Gazette.*

PROGRESS IN WAR MATERIAL IN 1905.—*New Naval Guns.*—By the courtesy of Vickers, Sons & Maxim, Limited, we have been furnished with a set of lithographs and descriptions showing their latest designs of guns, mountings and ammunition, with a statement as to ballistic powers. Many of these are quite new, and form the most powerful types of weapons which have been mounted in any vessels afloat. The 12-inch, 9.2-inch and 6-inch types are assumed to be firing capped projectiles, and the results are based on "actual penetrations obtained with lower velocities." With a capped projectile of 850 lbs., and a muzzle velocity of 2850 foot-seconds, the 12-inch gun has a penetrative power of 24.3-inch into K. C. plate This figure is much modified, of course, at ordinary ranges in action—say, at 4000 yards—but still the powers are gigantic. With a capped projectile of 380 lbs. and a muzzle velocity of 3048 foot-seconds, the 9.2-inch gun has a penetrative power of 20 inches into K. C. plate. With a capped projectile of 100 lbs., and a muzzle velocity of 3060 foot-seconds, the 6-inch gun has a penetrative power of 12.25 inches into K. C. plate. The calculated perforation of the uncapped 31-pounder armor-piercing projectile, fired from their 4-inch gun, is equally remarkable, being no less than 11.5 inches of mild steel plate; nearly three times the caliber of the projectile! We observe that the calculated perforation of the 12-inch gun with the same projectile, capped, at a striking velocity of 2700 foot-seconds, based on Tresidder's formula, is given in his paper in Brassey's *Annual* for 1905, as 24.9 inches of K. C. steel. The figure given for penetration by Vickers, Sons & Maxim as the result of the calculations made by actual experiments is, therefore, eminently satisfactory. Tresidder's formula gives 19 inches as the penetration into K. C steel, with a capped 9.2 armor-piercing projectile at a velocity of 2700 foot-seconds. The results formulated by Vickers, Sons & Maxim give 20 inches, but with a velocity of 3048 foot-seconds. These may be regarded as equally good. Tresidder's estimated penetration into K. C. steel for the 6-inch gun with capped projectile at 2700 foot-seconds is 12.1 inches. The results obtained by Vickers, Sons & Maxim with 3060 foot-seconds were 12.25 inches. The close approximation of the estimates based upon Tresidder's formula with the results obtained from actual experiments by the great gun firm is very reasuring. One of the chief features in the breech mechanism of the recent Vickers, Sons & Maxim guns is the application of a "pure couple" for rotating the breech screw. By its application the whole of the available turning force applied to the breech screw is utilized in seating the obturator. The caps for the armor-piercing shells supplied by this firm are secured to the point of the projectile without the cutting of cannelures around it. This is an element which should give additional strength to the shell in its passage through armor.

Before leaving the subject of guns we deem it necessary to allude briefly to the agitation which took place during this year in regard to the large numbers of 12-inch naval guns of the Mark VIII. pattern, which were found to be unduly defective in their A tubes on examination, and to several serious misadventures which occurred with some of these guns, the forward part of whose tubes was blown away upon the guns being fired. This was notably the case on the Majestic, one of the 12-inch guns having several feet of the tube at the muzzle blown clean out, and another 12-inch gun being seriously injured. This was at ordinary gun practice The official report of the Ordnance Committee upon the failure of these guns generally ascribed their reduction in caliber—which was, of course, the primary reason for the dangerous choke at the muzzle—to longitudinal extension of the service A tube, due apparently to the design of that particular "mark." The report said that the whole of the sixty Mark VIII. guns would have to be "lapped out" sooner or later, but that the deeper

step and thicker A tube of the later marks—Mark IX.—would probably prevent the same thing happening again.

Projectiles.—It is satisfactory to note that the "capped" projectile has at last "come to stay" at the Arsenal. A considerable number of Hadfield's "Heclon" capped armor-piercing shells of 6-inch, 7.5-inch and 9.2-inch calibers is in evidence in the Royal Laboratory, with the "thumb marks," which are characteristic of them, to be seen at the base of the caps, these being the impress upon the soft metal cap where it is hammered into the milled recesses on the nose of the projectile. Firth's "capped' armor-piercing shells of many calibers are also to be seen in large numbers, being recognized by the annular groove or grooves in the nose of the shell, and other corresponding grooves inside the cap, which are fitted in some cases with an iron rod run round, or tinned and sweated together with low fusing-point solder. These are the Firth and Firth-Sterling caps. The Royal Laboratory authorities have a pattern of "cap" of their own, though it is not yet in evidence, being under consideration; but we believe it to be a modification of the annular groove principle of attachment to the point of the shell. Judging from the large number of capped shell which are in course of treatment at the Arsenal at this moment, it would seem apparent that the system has received approval from H. M. Government.

To turn to the question of projectiles generally, it is interesting to observe that all the best results of experimental trials made with armor-piercing shells during the year have been with capped projectiles. Information of a remarkable character is to hand. We have already attended to the capped "Heclon" shell from Handfield's Steel Foundry Co., which have been delivered into the Service, and which have successfully passed the severe ordeal of penetrating—whole—a one-caliber thickness of Krupp cemented plate. In Spain Messrs. Hadfield have been correspondingly successful, having completed the unit of large caliber capped shell for the Spanish navy One of the "Heclon' projectiles has recently been fired at an important foreign Government proving-ground, and gave remarkable results. The plate attacked was 12 inches in thickness, of the K. C. type, backed with 12 inches of oak backing, and three ½-inch skin plates. Such a plate is usually attacked by a one-caliber projectile—that is 12 inches—but in this case a "Heclon' projectile of 10-inch caliber was fired at it, with the low velocity of 187 foot-seconds. The shell perforated the plate and backing, and was found with only the point and two pieces of the shoulder broken off no less than 2600 feet beyond the target. When we compare this result with that obtained by each of four 9.2-inch projectiles, fired against a sample 9-inch K. C. plate, for the Japanese battleship Kashima, and manufactured by Thos. Firth & Sons in December, 1904, the advantage of the cap is very pronounced. The striking velocities of the four rounds was from 1814 foot-seconds to 1985, the mean velocity being far superior to that of the "Heclon" shell. The four Firth shells were all broken up, and the greatest penetration was 3.1 inches. After such a result from a capped projectile, far surpassing any hitherto recorded, the superior advantage of the "cap' appears proved to the hilt. No 10-inch uncapped shot could have pierced the 12-inch K. C. plate under any circumstances, but we believe that the "Heclon" steel shell would have broken the record by getting through even a 10-inch plate at so moderate a velocity. As it is, the result must be regarded as unique. The "Heclon" 7.5-inch capped projectiles have also repeatedly perforated 9-inch K. C. plates at 1975 foot-seconds, velocity, the shell passing through this severe test and being found practically undamaged far beyond.

Armor Plates.—As usual, we have not much to record upon the important question of armor-plates. The various makers in this country being pledged to secrecy, very few results are made public, and official trials are usually made with low velocity and a onecaliber plate, or such a trifling difference exists as would be between a 9-inch plate and a 9.2-inch shell.

In America the velocities are usually very low indeed, so that penetration could hardly be expected. Indeed, the main idea seems to be the obtaining of a plate which will not break up under fire, from a shell of equivalent dimensions, caliber to thickness, at such a striking velocity as might be expected at fighting range. Proof to destruction is seldom applied to heavy side or barbette armor. The effect of crushing fire at high velocities is left to be divulged by the circumstances of war. Hence the photographs of plates for the Commonwealth and Asahi, and their appearance after very mild attack from 9.2-inch guns merely show that they can be penetrated to the extent of 3 inches or 4 inches without serious cracks being set up, or the backs being destroyed. Some valuable particulars in regard to foreign armor-plate trials are recorded by Captain Tresidder in his excellent article in Brassey's *Annual*. The photograph of a sample cemented steel plate made for the Patrie by the special Marcell process of thickness tapering from 10.9-inch to 9.3-inch was fired at with 5-inch Chamond forged steel armor-piercing projectiles of 9.45-inch caliber, 317 lbs in weight, at striking velocities of 2054, 2201 and 2208 foot-seconds. The first shot broke up partly, but the second and third lodged in the plate unbroken. All bases projected to the rear about 7 inches, showing the excellent material of which they were made, though failing to penetrate. The plate was not cracked, and its behavior was considered so good that the highest classification for premium was accorded to it—"No. 6." Capital results have been obtained with plates made by Monsieur Charpy, of the St. Jacques Steel Works at Monthucon. Captain Tresidder says that the steel is expensive, being high in nickel, but the results obtained with it are highly commended by the Essen authorities. For thicknesses below 4 inches, where the Krupp process should cease, the Charpy plates constitute a decided advance on anything previously tested against an attack of a perforating as distinguished from a racking nature. They can be made as thin as 1-18 inch. Thus they would be of infinite service for the protection of our torpedo-boat destroyers against 6-pounder quick-firing guns, even when only of this slight substance.

Mr. R. A. Hadfield has made good progress with his "Era" steel plates during the past year, and is getting good results for shields and other similar purposes. We have already alluded in our columns to some of these results. The "Era" steel plates, which are cast and not forged contain a considerable quantity of manganese amongst other alloys. A 6-inch gun mounting, made of this alloy, was found to possess extraordinary gun-fire-resisting properties. A P-shell of 4.7-inch caliber, also common and lyddite shell of 6-inch caliber, were fired against it at velocities up to 2128 foot-seconds, but failed to penetrate. Finally a 6-inch armor-piercing shell was fired with a velocity of 2039 foot-seconds, but, although almost half of this shell got through, it is believed to have burst on the outside. At lower velocities the shells merely made an indentation. The plate was quite uncracked. We learn that at Shoeburyness, with a 6-inch "Era" steel armored plate, still more remarkable results were obtained. Projectiles from 6-inch, 7.5-inch, 9.2-inch and other guns were fired at it at an angle of 30 degrees from the perpendicular to the plate's face. Some were capped, the others not. The capped shot generally got through, except, we believe, the 6-inch, which was deflected. The uncapped shot did not penetrate except in one instance of the smaller size. Singularly enough, the cap appeared to cause the smaller projectile to fail in penetration. A 7.5-inch "Era" steel gun shield has now been prepared by the Hadfield Co., which is, we understand, being experimented with by the artillery authorities at Shoeburyness.

Range Indicator.—We cannot conclude this summary without a reference to an invention of great value, which as been perfected for the navy during the past year, and which is called the Vyvyan-Newitt range finder. It is the invention of Lieutenant Arthur Vyvyan, the details of mechanism having been designed by Mr. Newitt, R. N., an electrical engineer. The

main idea is that of transmitting the range observations, taken by a range officer stationed in the "fire control top" upon the mast of a war vessel, automatically, to the various gun positions on board. A series of electric motors, running at a uniform speed, is provided, one in the top, the others at the gun positions. Any movement in the motor at the top is transmitted automatically to the gun positions. Thus, when the range officer in the top sees an object or vessel to be brought under fire, he estimates distance, and informs the officer at the instrument in the top, who fires a gun for trial shot, say 400 yards short of estimate, and sets his instrument running with the pointer on a dial to indicate same to gun positions, all the instruments of which record similarly. The speed of ship and deflection of the range are provided for automatically. If the observing officer reports distance under-estimated, a second trial shot is fired, say at half the under-estimate. This will probably bring the instrument's pointer to a close approximation of the range; if not, a third can be fired. All this will not occupy more than a few minutes, and the instant that the recording officer in the top hits the range, all the gun positions have it too. The installation for working this range transmitter is running at Whale Island with remarkable smoothness and accuracy, and a duplicate has already been placed on a war vessel.—*Engineer.*

NEW SMALL ARM BULLET.—The new "D" bullet, shortly to be issued to the whole of the French infantry, and already supplied to the XXth Army Corps, is described as a cigar-shaped cylinder of bronze, and not of lead, cased with nickel, similar to the old Lebel bullet. It revolves at the rate of 3600 turns a second during its flight At 800 yards it will penetrate a bulk equivalent to six men standing one behind another. The cartridge is absolutely smokeless. All the Lebel infantry rifles are being refitted for the "D" bullet with fresh sights up to 2400 meters.—*United Service Magazine.*

The expense of re-armament being almost prohibitive, Germany has attempted to secure the advantage of a smaller caliber with her present small arms by adopting a much lighter bullet with a long, tapering point. The new bullet is known as the "S" bullet.

TELESCOPE SIGHTS FOR FRENCH SHIPS.—Telescope sights are being fitted to the heavy and medium guns of the French battleships. The Iéna and Suffren have already been furnished with these sights.

In an article entitled "Torpedoes for Torpedo-boats," the *Moniteur de la Flotte* raises the question whether torpedo-boats should not be supplied with torpedoes of special design, having the maximum possible velocity over a short range.

THE NEW TURBINE TORPEDO OF THE UNITED STATES NAVY.—It is always difficult to ascertain just what other navies are doing in torpedo work, because special secrecy is maintained with regard to what is still considered to be one of the deadliest forms of naval warfare; but the new turbine torpedo, known as the Bliss-Leavitt model, which has recently been adopted by the United States government, furnishes the American navy with what is probably the speediest and most effective weapon of the torpedo type in existence.

The new weapon conforms, in its external appearance and in the leading features of its internal sub-divsion and method of control, to the Whitehead, but in size, power, speed, range and accuracy it far surpasses it. The Whitehead of the standard type as used in the United States navy has a speed of 28 knots and a range of about 1200 yards, and about 22 knots at 2000 yards. The new torpedo has a range, guaranteed by contract, of 3500 yards, and its speed is 28 knots at this range and 36 knots at 1200 yards range. The United States government has been so well satisfied with the new weapon that contracts, amounting to several mil-

lions of dollars, have been awarded for the construction of this type of torpedo, which, from this time on, will be the only type used in the navy. Two sizes are being made: one, 18 inches in diameter, which can be fired from the existing 18-inch tubes on our battleships and torpedo boats; and the other, a much larger and more powerful torpedo, 21 inches in diameter. The 18-inch torpedo of the new type has an effective range of 2000 yards and a speed of 33 knots, and 100 of this type have been contracted for, while of the larger 21-inch, 300 are called for by the contract. Thirty of the 18-inch and two of the 21-inch have been delivered at the torpedo station at Newport, where officers and men are instructed in torpedo work under probable war conditions.

By the courtesy of the Bliss Company our representative was recently given an opportunity to study the construction of the new torpedo in the special department of the works set apart for torpedo work. The new 21-inch type consists essentially of three sections. First, the head containing the explosive; then the central flask in which the compressed air for driving the torpedo is stored; and last, the after body, which contains the turbine for operating the propellers, the immersion chamber for regulating the depth of the torpedo beneath the surface of the water, and the gyroscope gear by which the torpedo is automatically steered and maintained on its proper line of flight.

The head is a beautiful specimen of hammered sheet-metal work. It is formed in two halves, divided longitudinally, the edges of the joints being made with a square, saw-tooth form and brazed together. The war head, which, as distinguished from the practice head, is used only in actual hostilities, is loaded with 132 pounds of gun-cotton, containing 25 per cent of moisture. The gun-cotton is packed in disks through the center of which is a hole that contains cartridge primer of dry gun-cotton for detonating the charge. The small propeller carried at the extreme point of the torpedo is for preventing premature explosion, which it does by locking the firing pin. When the torpedo enters the water, the revolution of the propellers releases a sleeve, which uncovers the firing pin, putting it in position to strike the detonating primer the instant that the torpedo finds its mark. The central body, or shell of the torpedo, occupies a little more than one-half the total length. It is made of a special forged steel of an elastic limit of at least 90,000 pounds. The rough forging is over 1¼ inch in thickness, and it is bored and turned down in the lathe to a finished thickness of 7-16 of an inch. The "flask," as the central portion, or air chamber, is called, is to be the turbine engine of the torpedo what the boiler is to the reciprocating engine of a steamship. It is charged at an initial pressure of 2225 pounds to the square inch.

The after portion of the torpedo, or the tail, contains in its forward end the wonderful little torpedo engine which drives the propeller. It is of the Curtis compound type, and consists of a central row of fixed blades and two wheels, one 11⅛ inches and the other nearly 12 inches in diameter. There are two propellers, adapted to run in opposite directions, one being fixed upon the central shaft, and the other upon an enveloping outer shaft. The turbine runs at a speed of about 10,000 revolutions per minute, which is reduced by suitable gears to a speed of 900 revolutions for the propellers. At this speed the turbine developed about 160 horsepower, the corresponding speed being 40 knots an hour, although the contract speed required by the government is only 36 knots.

Immediately astern of the compartment containing the turbine is the wonderfully ingenious and delicate apparatus for maintaining the proper depth of immersion and for steering. The regulation of the depth is effected by means of a vertical diaphragm, on one side of which is the water, which is allowed to enter by holes provided in the shell for that purpose, and on the other side a series of coiled springs, the water pressing against the diaphragm in the opposite direction on the other side. The springs are adjusted so that their pressure shall exactly equal the pressure of the water at the given depth at which the torpedo is to travel. If the torpedo descends below that depth, the water pressure, overcoming the spring

pressure, pushes the diaphragm inwardly. If the torpedo is above the desired depth, the springs overcome the water pressure, and push the diaphragm outwardly. The center of the diaphragm is attached to certain levers and rods, which pass through the tail of the torpedo and act on a pair of horizontal rudders, throwing them up or down, according as the diaphragm is pressed inward or outward, and thus correcting the deviation of the torpedo from the horizontal plane at which it is designed to travel.

Astern of the immersion chamber is located the steering gear. This is a modification of the principle employed in the Obry gear, and depends upon the well-known tendency of a gyroscope to maintain itself in its original plane of rotation. The Obry gear was given its high velocity by means of a coiled spring which was released at the moment of firing. In the Bliss-Leavitt torpedo the spring is dispensed with, and a small reaction turbine is used in its place. This consists of a disk with a series of discharge orifices arranged tangentially to the circumference, which are fed wth compressed air. The air rushing from the orifices reacts on the disk, and turns it exactly in the same way as did the pipes on Hero's original turbine of two thousand years ago. If the torpedo tends to deflect to the right or to the left, this little gyroscope turbine maintains its original position, and its angular motion with regard to the torpedo (or to speak more accurately, the angular motion of the torpedo about the gyroscope) serves to actuate a very ingenious mechanism, which turns the vertical rudders to the right or left, and corrects the deviation. The turbo-gyroscope is driven at a speed of 18,000 revolutions per minute.

Of course, the most interesting feature in the building of the new torpedoes is the construction of the wonderfully efficient little turbine engine that drives them. The Bliss Company has designed a very effective machine for cutting the buckets of the turbine wheels. The whole wheel is made out of a single disk of steel. The buckets being integral with the wheel. The machine for cutting the buckets resembles a double-spindle lathe. The work is held in a horizontal position on the tail stock, and two cutters alternately advance toward the rim of the wheel, make a cut of the desired curvature and recede, leaving the wheel free to revolve sufficiently to bring the next bucket into position for another cut. One cutter operates on one wall of the bucket, and the other on the opposite wall. The result is a wheel of perfect form, carrying a highly finished surface. It should be mentioned here that the remarkably high efficiency is speed and range of the new torpedo is due to the use of a superheating process applied to the compressed air. This consists of a flame which is automatically ignited, the instant the torpedo is launched from the tube, and which burns during the entire run. The compressed flask contains a burner or pot, the flame of which is fed automatically with alcohol. The flow is so regulated that an even and steady temperature is maintained in the air flask.

During the past few months, the company has been carrying out a series of very exhaustive tests on board the proving steamer *Sarah Thorpe*, which is anchored in the secluded waters of Noyak Bay, near Sag Harbor, Long Island. Here each torpedo is tested and brought up to the required standard of efficiency in speed and range before being turned over to the torpedo station at Newport. The Navy Department assigned a lieutenant and several gunners to witness and record the run of each torpedo. The target is a submerged net, 100 feet in length, which is located 1200 yards from the point of fire. The torpedo breaks through the meshes, and after each shot the net is hauled up, and the exact striking point is located by the tear in the net The maximum deviation in the range allowed is 15 feet to the right and left of the bull's eye, and 30 inches above and below at five feet of depth. Each torpedo must come within these measurements in three out of five trial runs, in order to be accepted. The average speed of the run is 36 knots, and the time run is about 60¾ seconds for 1200 yards. The cost of the 18-inch torpedo is about $5000, and the 21-inch torpedo costs proportionately more.—*Scientific American.*

MISCELLANEOUS.

IMPORTANT SUBMARINE EXERCISES IN FRANCE.—The recent French Service papers give a highly interesting account of certain maneuvers that recently took place at Toulon, in which the submarines attached to the port played an important part. The general scheme of the operations was that the reserve squadron, comprising the battleships *Brennus, Charles-Martel* and *Hoche,* should make a feigned attack on the harbor. The ships were supposed to know that submarines were present, but were not aware of their position. The destroyer *Dague* was sent out with the special mission of maneuvering so as to entice the squadron into the channel wherein the submarines were concealed. Admiral Fournier, inspector of submarine defences, has issued an order of the day dealing with the results obtained. After complimenting the officers commanding, and the crews, upon the excellent condition of the flotilla, and the spirit and skill displayed, he proceeds to describe the operations.

The maneuvers lasted from 7 a. m. to 5 p. m. on November 13, in spite of a fresh breeze and considerable sea. None of the five submarines engaged were made out from the battleships until the moment when torpedoes were discharged. The *Bonite* discharged her missile at 400 meters, the *Soumer* at 100, the *Grondin* at 200, the *Gustave-Uede* at 200, and the *Thon* at 50 meters The *Bonite's* torpedo struck the *Charles-Martel,* while the *Souffler* accounted for the *Brennus.* Such results, says the Admiral, point to the success which may be anticipated in future from the operations of this class of vessel, and to the necessity of promptly organizing the personnel by which they are to be handled.

Subsequently, on December 7, the five submarines mentioned above, reinforced by three others, made a second successful attack on the squadron when under way off Hyeres, the operations lasting three hours.

A pontoon, with a lifting force of 60 tons, constructed by a private firm, which has for its object the lifting of submarines, was tried at Toulon on December 11. A submarine immersed at a depth of eight meters was made fast to the pontoon, and brought to the surface without difficulty. Similar pontoons will, it is expected, be attached to each of the naval ports. —*United Service Gazette.*

SPEED TRIALS OF TORPEDO CRAFT.—Mr. S. W. Barnaby, member of the Council of the Institute of Naval Architects, delivered the Watt anniversary lecture at Greenock on January 19, the subject being "Marine Propulsion."

In the course of his remarks, Mr. Barnaby stated that numerous experiments had been made by Rasmussen, Paulas, Rotah, Yarrow, and others, showing that, whereas at moderate speeds shallow water enormously increased the resistance, yet at higher speeds shallow water, on the contrary, reduced the resistance below that obtained in deep water. Messrs. Thornycroft had found that the speed of some torpedo-boats recently built for the British government was 1½ knots more in 50 feet of water than in 65 feet, this being the difference between high and low water on the Maplins.

Singular results had been obtained on the trials of the *River* class of destroyers. It appeared at first impossible to obtain a speed of 25½ knots with any of the class in less than 120 feet of water, and the speed was three knots less in a depth of 50 feet on the Maplins than in a depth of 240 feet on the Clyde It was subsequently found by Mr. Yarrow that at a depth of 25 to 35 feet the resistance did not exceed that in deep water. The worst depth for a given speed was that in which a solitary or non-repeating wave was produced. At higher speeds this solitary wave could no longer keep pace with the boat, and there was practically no wave making. From Colonel Rota's experiments it was possible to calculate approximately the best depth of water for ships of various forms and speeds, and he (the lecturer) had calculated the depths for least resistance

for a few typical vessels of the destroyer class. The best depth of water for the coastal destroyers of from 200 to 215 tons and 26 knots speed appeared to be about 20 feet, and the resistance was greater at any depth exceeding this. The normal deep water resistance was met with at 98 feet, and there could be no appreciable advantage in running in deeper water than this.

The resistance of the *River* class was at a minimum at 20 feet, while it reached a maximum at 67 feet, and dropped at 135 feet to the same amount as at 29 feet, remaining nearly constant at all greater depths. The figures for these boats accorded very closely with the results of the trials. It appeared that the new ocean-going destroyers of 33 knots should do best in about 32 feet of water, and the normal deep water resistance occurred at about 150 feet, and was then greater than at 32 feet. A vessel of the destroyer type of 36 knots seemed likely to do best in a depth of 36 feet, and normal deep water resistance would be met with at 170 feet.—*United Service Gazette.*

British destroyers in future, instead of carrying two 12 cwt. anchors, will carry one of 15 cwt. and one of 12 cwt. In order to counterbalance the extra weight all destroyers when fitted will be called upon to return awning stanchions and such like fittings to the extent of 3 cwt. or 4 cwt. —*Engineer.*

The boatswain's pipe, which has been displaced in the navy by bugle calls, is to be restored to favor. The Admiralty have agreed to the supply of pipes to enable systematic instruction in their use to be given to petty officers and boys. Twelve pipes of six different compositions, are to be supplied to the *Exmouth* flagship of the Channel fleet, for trial as to the best type for the navy.—*United Service Gazette.*

ROYAL UNITED SERVICE INSTITUTION PRIZE ESSAY.—The Council have selected the following subject for the naval essay, 1906, for the gold medal of the institution:—

"What is the Relative Value of Speed and Armament, both Strategically and Tactically, in a Modern Battleship, and how far should either be sacrificed to the other in the ideal ship?"

The usual regulations regarding the essay will be issued with the January number of the R. U. S. I. *Journal.—United Service Institution.*

Prizes are offered by the *Marine Rundschau* for essays upon "Trafalgar and Tsushima,' to be written by its subscribers, and to be sent in by November 1. A comparison is to be made between the two engagements in their naval importance and political consequences, keeping in view the qualities of the personnel and the material, with a parallel between the two actions, and indications of the principles they suggest for modern naval warfare. The essays are to be written and sent in practically under the same conditions as the prize essays of the Royal United Service Institution, but there will be three money prizes, respectively of 1000, 600 and 400 marks. The winner of the first money prize will also receive a prize of honor.—*Army and Navy Gazette.*

SPEED TRIALS OF ATLANTIC FLEET.—In the service speed trials of the Atlantic fleet, the *Commonwealth* easily beat all the other ships of the *King Edward* class. On the eight hours' run a speed maximum of 19.4 knots was touched, and on the twelve hours, at four-fifths power, 17.7. At ten hours, three-fifths power, a maximum of 16.5 knots was recorded. The coal consumption, which is generally very heavy in this class of ship, was relatively small—at any rate, far better than in any of the others. The *Commonwealth* is what is known as "a Yankee ship"—that is to say, she is fitted with Babcock & Wilcox boilers. She was built and engined by the Fairfield Co., which turned out that excellent steamer the *Good Hope.* The boiler types engaged were: (1) Babcock, (2) Babcock and

cylindrical, (3) Niclausse, (4) cylindrical. The latter, fitted to the *Majestic*, had, of course, no chance, as the *Majestic* has a much inferior designed speed. The *Majestic*, however, carried off the palm for coal consumption, her average being almost exactly one ton per 1000 indicated horsepower per hour. The heaviest consumption was with the ships with mixed installations of water-tube and cylindrical boilers.—*Engineer.*

A PETROL TORPEDO BOAT.—On January 19 we had an opportunity of inspecting and of taking part in a trial run of a new petrol launch which has just been built at Messrs. Yarrow & Co's works at Poplar. This little craft, which is only 60 feet in length by 9 feet beam, was built, so we understand, for use as a second-class torpedo boat, and if used for this purpose the tube would be carried aft, and a quick-firing gun in the bows. A peculiarly shaped hull, with a flat bottom, has been adopted, it being claimed that the boat of this form will swim upon the surface of the water. Practical experiments have demonstrated that a speed of one knot more can be obtained with this form of hull than with any other with a given power; the reasons assigned for this being that the bows of the boat rise, the result being that there is a gliding rather than a cutting motion, and that that portion of the power which is usually expended in producing surface disturbance, or what is called "wave making," is utilized for propulsion. The boat is said to have excellent sea-going qualities, as good as can be expected from a craft of this size.

The petrol engines, which have been made to the designs of Mr. Napier, develop about 300 horsepower. There are three units driving three propellers. The starboard and port engines are of 120 horsepower each, and there is a smaller unit in the center of the boat which develops 60 horsepower. The two outer propellers are only capable of going ahead, whilst the central propeller can be reversed, it being considered that this amount of reversing power is sufficient. The clutches are of metal to metal. The three sets of engines are all controlled from the same board, by means of three throttle and three control levers. Speed indicators are also placed in a convenient position so that the speeds of the three shafts can be regulated. One high-tension ignition box for each of the side engines, with single coil and an eight point distributor, has been provided. While the center motor is driven from a single coil and four point distributor. One of the special features of the boat is the arrangement of the petrol tank. In order to obviate all danger due to the use of this spirit the main petrol tank is quite separate from the remainder of the hull, so that in case of damage to the tank the petrol would simply flow into the sea, and not into the boat, and, in case of any conflagration, the flame, when the boat is travelling, would pass away from the hull. For a length of about six feet at the stern of the boat the hull is designed to form a "tray," upon which this tank rests. It is sufficiently large to carry one ton of fuel, a quantity which, it is estimated, will drive the boat for nearly 300 miles. The speed of the boat is high. On a series of trials recently carried out over a measured mile, she attained a speed of 26.15 knots, which, we believe, to be unprecedented for a boat of these dimensions. This increased speed is said to be due to several reasons. First, the much lighter weight of the machinery of the internal combustion type, as compared with those driven by steam, the saving being nearly 50 per cent; and, secondly, the form of hull, which, it may be mentioned, only draws a foot of water when at rest. A feature worthy of mention is the small amount of wash caused by the boat's progress through the water. The weight, including the hull and propelling machinery, does not exceed eight tons.

As to the future of this type of boat, it is claimed that if such a launch be fitted with torpedoes it would be eminently suitable for the defence of a port or a coast, and that a certain amount of money would be more advantageously spent in obtaining a large number of such craft, rather than a few vessels of larger size. For example, the cost of a modern destroyer is said to be about fifteen times as great as the cost of the boat just de-

scribed. For the purpose of defending a port from an attacking or a blockading fleet, fifteen small vessels of high speed, which it would be difficult to hit, should offer a much safer means of defence than one destroyer of large size, upon which the fire of a number of guns could be concentrated. There is also another point in connection with these launches. The number of the crew working the machinery is about half what is needed for this class of boat if propelled by steam.—*Engineer.*

FIGHTING INSTRUCTIONS OF HAWKE AND RODNEY.—One of the most interesting, as well as the most notable among the naval events of the week, has been the publication in the *Times* of an article by Mr. Julian S. Corbett on "A Missing Link in the History of Naval Tactics; the Fighting Instructions of Hawke and Rodney." The volume which Mr Corbett recently edited for the Navy Records Society on "Fighting Instruction" was a very valuable contribution to naval literature, and only the absence of one important link in the chain of evidence marred the completeness of the work. Mr. Corbett had been unable to trace the additional fighting instructions of Rodney used in the campaign of 1779-1782, and like many other people he was afraid that they had been lost. This, however, is not the case. In a memoir of Lord Rodney, published by Mr. John Murray four years ago, the missing and invaluable document is mentioned as being in the possession of Mr. George Pritchard, and as Mr. Corbett puts it, the misfortune of its having been so long unheeded is not the fault of its owner, but of the naval historians. Mr. Pritchard has now placed the copy of the set of "Sailing and Fighting Instructions" which Rodney amended in MS., at the disposal of the Navy Records Society, and it will thus at last be possible to make good the ground which neither Lord Dartmouth's papers nor those in the British Museum, the Record Office, the Admiralty, or the United Service Institution were able to cover.

One of the results of the rediscovery of this document is that Mr. Corbett is able to deduce from Rodney's manuscript corrections and additions to the printed Fighting Instructions that for the failure of April 17, 1780, the admiral was not to blame. The point at which Hawke had arrived was that no system based on a defensive formation can lead to decisive results, and that vehemence, flexibility and directness of attack should take precedence of all other factors in formulating a tactical scheme. Fully appreciating and emphasizing Hawke's principles, Rodney simplified and strengthened his methods and intensified the whole by his brilliant conception of the concentrated attack. Hitherto, Rodney's reputation as a tactician rested mainly on his breaking the line. His additions to the printed instructions show that it should and does rest on the fact that he, first of all our prominent naval men thoroughly grasped the principle of concentration in attack. It was the inability of Captain Carkett to recognize the meaning of the admiral's signals in the battle that ruined Rodney's dispositons and snatched from him the fruits of victory. De Guichen realized his opponent's intention, and after the action sent Rodney word that, had the signal been obeyed, he himself would have been a prisoner in the English fleet. The history of the evolution of tactics in the eighteenth century has been wonderfully cleared up by this discovery, and the thanks of naval students are due firstly to Mr. Pritchard for bringing the copy to the notice of the secretary of the Navy Records Society, and secondly to Mr Corbett himself for his masterly exposition of Rodney's emendations and additions to the instructions, which he clearly demonstrates to have been the work of Hawke, Rodney's great predecessor.—*Army and Navy Gazette.*

THE CUNARD TURBINE STEAMER CARMANIA.—Great interest has naturally been aroused by the arrival in New York harbor of the new Cunard liner *Carmania*, fitted with Parsons steam turbines for the propulsion of her three screws. She is in general respects a sister ship to the *Caronia*, whose arrival here in the spring was noted in these columns. She is 672

feet 6 inches over all, with a gross register of 19,524 tons and a displacement of 30,918 tons. Her boilers have a capacity of 21,000 indicated horsepower, and the steam pressure is 195 pounds per square inch, the turbines taking steam at an initial pressure of 150 pounds. There is a general saving in weight by the adoption of the turbines of about 5 per cent. The high-pressure turbine is on the center of the three shafts, and one combined low-pressure and astern turbine on each of the two wing shafts. The appearance or effect is curious. It is apparently an engineless engine room, but there are many elements that help fill up the space. All the auxiliaries are driven by reciprocating engines, except where one or two electric motors are used. There are about 1,115,000 blades on the turbines; the longer blades of the low-pressure turbines are bound together by two circumferential strips laced with copper wire and soldered. The screw shaft speed is 185 r. p. m.

The electrical equipment, in the orlop deck aft of the engine room is occupied by four generating sets, each of 75 kw. capacity, running at 450 r. p. m. There are about 300 incandescent lamps. From the main switchboard run 36 circuits, 16 for ship lighting, 10 to the thermo tanks and ventilating fans, three to the electric heaters, three for the motors on the turbine lifting gear in the engine room, two for the boat hoists and one to the searchlight projector. The lavish use of electric heaters is quite noticeable. There are four in the main saloon, of 20 amp. each.; two in the writing room, two in each of six staterooms, and one in each of the first-class bathrooms. The second size take seven amp. and the smallest five amp.

Motors are to be seen all over the ship. In the engine room there are three, each of 18 brake hp. for lifting the turbine cases and rotors. On the boat deck are two electric winches with warping drums for lifting the ship's boats. In the storerooms on the lower deck three electric hoists handle supplies for the galleys and pantries. One 500-pound hoist of 35 brake hp., and one 300-pound hoist of 1.56 hp. supplies the first-class galley, while a similar one is located in the third-class galley and pantry. These motors with their controllers are all on the lower deck. A 200-pound coal hoist is placed in one of the vent shafts from the stokehold, to raise coal for the first-class galley. In the mail sorting room, aft on the upper deck, a 4-hp. motor, lifting 500 pounds at 150 feet per minute, is employed for delivering the mails to the mail room on the orlop deck.

The electrical equipment of the galleys and pantries includes one dough-mixer for the bakehouse, one roaster for the first-class galley, one dish-washer for the first, second and third-class pantries, one grid in the first and second-class pantries, the bridge deck service pantry, the promenade deck service pantry, the first-class smoke-room bar, and the officers' pantry. In addition to these there are three knife cleaners. The first and second-class barbers' shops are provided with an electric hair brusher and a one-gallon electrically-heated hot water urn. Small fans are provided for the chief engineer's cabin, engineers' mess, doctor's and first-class barber's shops and at other points. There is aso a very complete telephone system and a submarine signaling equipment, as well as a regular Marconi wireless outfit. The turbine outfit had a severe test on the outward trip, and underwent the ordeal splendidly. The storms encountered were tremendous, but the usual vibration was reduced to a minimum.—*Electrical World and Engineer.*

THE TURBINE IN GERMANY.—Two turbine-propelled naval vessels, the cruiser *Lubeck*, and the torpedo boat *S* 125, were built for the German navy last year, the former by the Vulcan Works and the latter by Schichau, as an experiment.

The *Lubeck* made the most important trial trip in company with the *Hamburg*, which has piston engines, in order to be able to make unobjectionable comparisons between the two systems. The *Lubeck* has finally beaten her sister ship in speed as well as in economy in coal consumption.

This latter point is the crucial question in the construction of turbines. It is not difficult for turbine steamers to attain the desired speed, but to keep the consumption of coal down as low as with piston-engine vessels is a different matter. The greater the speed the more economical and proportionately lower is the consumption of coal for turbines; the slower the speed the more they consume as compared with piston engines. As war vessels in general run with little speed (10 to 12 miles per hour) and make us of their greatest speed only during manuvers, and of course during a fight, it is evident that the consumption of coal at a speed of 10 to 12 miles must be the determining factor. With passenger ships, which almost always make the same speed, the problem is much more simple for the turbines, and the consumption of coal is much more economical. The most difficult question appears to be with reference to the use of turbines for torpedo boats, as they use a speed of 11 to 12 miles up to 28 to 30. The case is similar also with cruisers. The *Lubeck* speed varied from 10 to 23.8 miles.

In spite of all obstacles the German Turbine Co. was successful in complying with the very severe requirements of the German navy department with reference to the consumption of coal. At a wind velocity of 5 to 7, in very bad weather, a maximum speed of 23.88 and an average speed of 23.16 were attained. *S* 125 has also given thorough satisfaction, and attained a maximum speed of 28.5 miles, while the navy department called only for 27 miles. With both vessels the lack of any vibration, even under highest speed, was noticeable, an advantage which speaks for the turbine along with many others.

In the German merchant marine there is so far but one vessel with turbine engines, which was built at the Vulcan Yards at Stettin as an experiment by the General Electric Co and equipped with Curtis turbines built by the General Electric Co. itself.—*Nautical Gazette.*

THE SIZE OF WAR VESSELS.—In building 18,000-ton armorclad vessels the Japanese are but following the lead we have set in the design of our latest battleship, the *Dreadnought;* but they have the advantage, which no other nation with a strong fleet possesses, of practical experience with very big ships of the line in an important contested battle; and it is for this reason that the decision of Japan carries exceptional weight. Germany appears also to be profiting by the lessons of the late war in the Far East, it being stated that the new German battleships will have a displacement of 18,000 tons, whilst the new cruisers that are to be built will each displace 15,000 tons. According to the *Cologne Gazette* this heavy displacement is felt by the German authorities to be necessary owing to the lessons taught by the Battle of the Sea of Japan.

The ever-increasing size and cost of warships is inevitable so long as there are warships and engineering science progresses; it is useless, therefore, regretting what is inevitable. The old *Dreadnought*—the re-designed *Fury*, and one of the earliest of the mastless ironclads—was 325 feet long, 10,820 tons, and 8210 indicated horsepower. Her speed was a little over 14 knots, and she was considered a marvel of size and power in her day; so much so that to many it seemed as if almost the final word had been said on ironclad construction—at any rate, that we had reached a type that might remain effective for as long a period as the wooden three-deckers, which had then not long become entirely obsolete. The cost of this remarkable vessel was not very much over half a million—under £600,000.

That was the *Dreadnought* of thirty years ago—she was completed in 1875; but what the *Dreadnoght* of to-day will cost is not yet revealed; we only know that over £400,000 are to be spent on her this year as a commencement. The total will hardly be less than three times that of the older vessel, seeing that the *King Edward VII.*, of 16,350 tons, cost a million and a half. A few years after the completion of the older *Dreadnought* a discussion arose, in the course of which the Admiralty authorities were

roundly taken to task for deficiencies in certain elements of attack and defence in some of their designs. The criticisms upon official procedure caused some searching of hearts at Whitehall, and the higher powers were inclined to ask those by whose advice they had to act why everything was not exactly as the outside critics would have it, in regard to armor, armament, speed, and other elements of design. As a reply, it was pointed out that a warship must be a compromise: she could not be supreme in every detail. The professional officers got out a design in which the most important demands of the critics were incorporated, and it was found that the cost of the vessel would be no less than £1,800,000. This was considered at the time a sufficient answer to those who asked for a perfect warship; the price of the compromiseless ship would be so absurd as to put it beyond the pale of possibility.

Now, after the lapse of twenty years, our experience leads us to look on this "absurd price" as something quite within the bounds of practical politics; only another quarter of a million, or perhaps less, and we shall have reached the once "impossible" figure. It is a question, however, whether the Japanese have not already reached it, for a leading Tokio journal states that naval experts have decided that in future battleships must displace 22,000 tons, that they must have an armament of fourteen 12-inch guns and must reach a speed of 20 knots. No one is better qualified than Japanese naval experts to know what is likely to be needed in future naval wars. In addition to the practical experience to which we have referred, they have intimate knowledge of our own practice and that of foreign nations, for they have had ships built in all the private yards of importance in most of the chief nations of the world. Up to now full details of their war experience are only known to themselves; but doubtless more complete information will be spread abroad in the fulness of time; for the present we may look on Japan as the center of authority on naval design.

Although it may be supposed we are within measurable distance of the £1,800,000 set down over 20 years ago as the figure at which compromise in battleship design would disapepar, it need hardly be said we are not within sight of the compromiseless ship; and, indeed, a few minutes' consideration will show that such a vessel must be as much a phantom ship as the craft of the Flying Dutchman. What is compromiseless to-day will be compromised to-morrow. We throw economy to the winds this year and go to 18,000 tons, with ten 12-inch guns; but Japan—it might have been another nation—caps our design by 4000 tons additional, and 40 per cent more 12-inch guns. But even here the Japanese authorities have to make some compromise in getting out their design, for—according to present information—they propose to give a speed of but 20 knots to their new vessels, whilst our *Dreadnought* is to be engined for 21 knots.

In saying that a compromiseless ship is a phantom, it will be seen that we take the future into account, for it would naturally be quite possible, were funds unlimited, to build a vessel that would excel all existing fighting ships. That, however, is not the practical question, for we can no more avoid the future than we can cancel the past. An American naval officer has, however, recently written a brief but suggestive article in which he sets forth the points to be observed in designing what he styles "compromiseless ships." Commander Bradley R. Fiske, U. S. N., the author in question, had advocated very large battleships of high speed in the prize essay of the Naval Institue which he wrote this year. He has been taken to task by some critics who point out that in every ship there must be a compromise. Commander Fiske tells us that he labored for several weeks in endeavoring to arrive at some law by which, for any given size of ship, the best combination of speed, armor and armament could be obtained. It is a problem that other naval officers have attempted to solve on more than one occasion, but it is, as we have before pointed out, one that is indeterminate, for the reason that Commander Fiske now gives

for his failure—namely, that the conditions under which a ship may have to fight are so various that what would be the best combination at one time would be not the best at another; in fact, the possibilities are too numerous, and the probabilities are too well balanced.

Foiled in his endeavor to evolve a perfect compromise, Commander Fiske cuts the knot by saying his ship "must be compromiseless.' To get such a vessel he would need a constructor's capital of 20,000 tons, with armor distributed along the water-line, and over widely-separated turrets. The speed would be 18 knots and the vessel "would carry many torpedoes of sufficient range to keep an enemy 4000 yards away." She would "carry a considerable number of the largest guns that have yet been built, and could carry such thick armor on the water-line, turrets, and conning-tower as to be practically invulnerable beyond torpedo range to any guns yet built, or building, for use afloat." Later on he says: "Ships of 20,000 trial-displacement tons seems to be what we (the United States Navy) need. They would be compromiseless, and have no offsetting disadvantages, strategical, tactical, or economical."

It will be noticed, first of all, that in this compromiseless ship her author has compromised what has always been considered one of the leading elements of designs—speed; for he is contented with half a knot lower than our *King Edward VII.*, of 3650 tons less displacement, to say nothing of the 21 knots of our new *Dreadnought*, of 2000 tons less, or the 20 knots of the proposed Japanese vessels of 2000 tons greater displacement than his design. This is a very important matter.

In return for this short-coming in speed, he offers "torpedoes of sufficient range and speed to keep an enemy 4000 yards away"; for the armor is only invulnerable beyond that range. Putting on one side the draft he here makes on the future—for he says it is not "the torpedo as it is to-day" he has in mind, but "the torpedo as it will probably be by the time the ships next appropriated for shall be completed"—putting this aside, and supposing "the torpedo as it will probably be" to have arrived, we find Commander Fiske compromising a proved valuable quality—speed—for an element of defence which has never yet proved its value in warfare, either real, or, so far as we are aware make pretend. The torpedo is a weapon of immense possibilities, as we have pointed out times out of number, and its moral effect is ever present, but that has always been in connection with its use from torpedo craft. The sacrifice of two or three knots—or more when on the ratio of displacement—would enable the *Dreadnought* to select her position in attacking Commander Fiske's supposed vessel, so that the numerous torpedoes might be practically out of action, and the battle left for guns and armor to decide. Beyond this, the torpedo, looked on as a projectile, is very bulky and exceedingly costly. The number carried must be limited.

Although we feel sure the majority of British naval officers will not agree with Commander Fiske in his distribution of the elements of attack and defence in battleship design, there are many who will support his main contention for big ships; and that his views are accepted by those in authority, both at home and abroad, is sufficiently proved by the naval programmes now put forward. It may be noticed, however—and we confess we do so with some surprise—that opposition to these views comes from an authority who has, by his writings, done more to gain the ear of the English-speaking public than any other man. We refer, of course, to Captain Mahan, of the United States navy. This gifted author has certainly put Great Britain under a great debt of gratitude by helping to impress on us the need for keeping our navy in a state of efficiency needed for the safety of the nation. We say "helping" advisedly, for the indiscriminate eulogy of some writers would lead one to suppose that before "The Influence of Sea Power upon History" was published England was oblivious to her need for a navy, that Campbell had never written his stirring lines, or that the popular agitation for a strong navy had not

arisen before Captain Mahan's book appeared. Captain Mahan is not, however, responsible for the extravagances of his injudicious admirers, who make claims for him which we are sure he would be the last to advance

Captain Mahan, writing in an American publication, dwells on the attack made by Admiral Togo on the Russian line, when the enemy was thrown into disorder, which "the Japanese were enabled to improve by being numerically much superior in armored vessels, on the whole, though with fewer battleships." He adds: "Indeed, the larger numbers of the Japanese increased much their ability to combine to advantage; for the possibility of combination increases with numbers." That is undoubtedly true; but it does not solve the problem, for in the big ship combination or concentration of force—one of the most important canons of land and sea tactics—is already effected, and the question still remains whether the, say, two strong ships or three weaker ones is the better disposition. Captain Mahan evidently leans to the latter view, for he says that "this (the ability to combine) if accurately inferred from the instance before us, sounds again the warning, continually repeated, but in vain, that in distributing fleet-tonnage regard must be had to numbers, quite as readily as to the size of the individual ship."

The expression is guarded, but the conclusion Captain Mahan would have us draw is evident, although he confesses that there is a paradox. "This I say," he adds, "fully conscious of the paradox, that an amount of power developed in a single ship is more efficient than the same amount in two." We need here a definition of the word "power." The standard by which ship-design should be judged is money. The true question is whether for a given sum for first cost and upkeep one ship or two had better be built. However, Captain Mahan's conclusion is: "In part, the present Japanese success has been the triumph of greater numbers, skilfully combined, over superior individual ship power too concentrated for flexibility of movement."

The conclusion to be drawn from the lesson of the battle here turns on the expression "skilfully," for if Captain Mahan had added, in the above quoted sentence, after "superior individual ship power," the words "unskilfully used," he would have more accurately have represented the conditions that were present, though he would have spoilt his argument.

In justice to a gallant but unfortunate fleet, we wish to add that the unskilfulnes which we have suggested was at that time not a fault of the Russian admiral or those in command of Russian ships. It is true that Togo outmaneuvered his foe from the first; and, indeed, the result of the battle was as much a foregone conclusion before Rojhdestvensky left the Baltic as was the Battle of Trafalgar when Nelson was watching Toulouse. The Russian admiral was set an impossible task. Commander Fiske does not fail to notice the weak part in Captain Mahan's argument. "Flexibility," he says, "has great value when we wish to apply many small forces at many points, as the Japanese did when they enveloped the Russians, and prevented them from escaping, after the Russians had been whipped."

The battle of big ships versus little ships has often been fought, on paper; naturally, it has always been a drawn battle. In the Sea of Japan, where the main issue was decisive enough, nothing was settled in this respect, for the forces were too unequal in everything but physical courage. The old weapons of the controversialist—concentration for the big ships, flexibility for the little ones—will be used again and again; but it appears to us that in the present case Commander Fiske's arguments in favor of big ships have not been upset by Captain Mahan; and the former certainly has the responsible authorities on his side so far; but we wish he had not placed so much confidence in a broadside of torpedoes at 4000 yards.—*Engineering.*

COMMENT BY COMMANDER FISKE.—The foregoing editorial from *Engineering* compares the proposed "compromiseless ship" of 18 knots and 20,000 tons unfavorably with the new *Dreadnought* of 21 knots and 18,000 tons. The argument seems to be logical, but is really fallacious, because it proceeds on a mistaken assumption, which it states as follows:—"In return for this shortcoming in speed, he offers 'torpedoes of sufficient range and speed to keep an enemy 4000 yards away;'" and "we find Commander Fiske compromising a proved valuable quality—speed—for an element of defence which has not yet proved its value in warfare," etc.

In the article called "Compromiseless Ships," which this editorial is discusing, it is nowhere stated, or suggested, that the comparatively low speed of 18 knots is to be offset by torpedoes. It would be impossible to offset it by torpedoes, because it would be impossible to put such an enormous weight into torpedoes as would make up, in a ship of 20,000 tons, the difference in speed between 18 knots and 21 knots. One of the best points of torpedo installation in battleships is the extremely small amount of weight required, relatively to the space occupied, because it gives to the constructor a lot of displacement, which he can utilize for *armor*.. The article distinctly stated that the "Compromiseless Ship," *besides having an armament and a speed entirely sufficient*, "could carry such thick *armor* on the water-line, turrets and conning tower as to be practically invulnerable, beyond torpedo range, to any guns yet built, or building, for use afloat."

It seems curious that this quality of invulnerability and the fact that it can be attained at distances beyond torpedo range by a comparatively small increase in displacement did not attract the attention of *Engineering*. The difference in armor thickness between vulnerability and invulnerability at 4000 yards may be exceedingly minute, and yet make the difference between being sunk and not being sunk. At this distance, there is *a definite critical thickness* of armor; and a principal intention of the article, "Compromiseless Ships," was to suggest that this can be carried *if* 20,000 tons be allowed, and the armor limited to turrets, conning tower and water-line.

The Imperial German Navy Office has recently produced, as a supplement to the official *Marine Rundschau*, a report on the development of German naval interests within the last ten years. It opens with an account of the increase of population in Germany and of German settlements abroad. Next follow particulars of the proportion that German maritime commerce bears to that of other countries. The third part is given up to an account of German shipping, and then come particulars of the trading fleet in home and foreign waters with a statement of its value and its work in the postal service. Other sections follow upon shipbuilding, harbors, fisheries, and German cables. The ninth part includes an exhaustive account of German trading and financial interests in all countries, including banking and insurance, and somewhat singularly a very complete view is given of French interests of the same kind drawn from the reports of French consuls, and then a short supplementary section is devoted to British interests. Other sections are concerned with food supplies and imports, the representation of German interests abroad, German schools and missions in foreign countries and the colonies, and the naval outlay, with comparative tables, and finally a comparison of naval strength in battleships and large cruisers. We reproduce the following tables from the last two chapters of this valuable work:—

Naval Expenditures, Not Including Pensions.

(Totals are expressed in millions of marks, expense per head in marks. 1 mark equals 25 cents.)

	1893	1903	1905	Increase from 1893 & 1905	Expenditure per Inhabitant. 1893	1905
Germany	81.241	209.551	233.410	152.169	1.64	3.72
Austria	21.417	42.589	77.880	56.463	0.52	0.94
Italy	76.100	101.733	101.798	25.698	2.68	3.13
France	202.642	250.778	251.879	52.237	5.28	6.44
Russia	169.765	254.388	251.936	142.171	0.95	2.02
England	290.516	734.053	681.146	390.630	7.70	17.70
United States	128.197	349.091	421.414	293.217	2.05	4.58
Japan	17.012	61.312			0.41	1.31

Fighting Fleets in 1905.

(Only the following are taken account of:—Battleships launched since 1881, and cruisers launched since 1886 and of at least 5000 tons displacement.)

	In Service		Completed		Building	
	Number.	Tons Displacement	Number.	Tons Displacement	Number.	Tons Displacem't
BATTLESHIPS.						
England	66	909.280	60	807.914	6	101.366
France	34	369.449	28	280.247	6	89.202
United States	29	387.754	16	182.232	13	203.522
Germany	25	292.231	20	226.231	5	66.000
Russia	15	185.780	11	126.114	4	59.666
Italy	15	187.505	11	137.005	4	50.500
Japan	14	191.781	11	139.455	3	52.326
CRUISERS.						
England	82	814.791	71	655.221	11	159.570
France	30	269.304	25	203.140	5	66.164
United States	18	210.536	10	104.098	8	106.438
Russia	15	131.692	11	86.692	4	45.000
Japan	14	126.818	11	95.618	3	31.200
Germany	14	114.596	12	91.396	2	23.200
Italy	7	54.980	5	35.320	2	19.660

ANNUAL REPORT OF THE SECRETARY AND TREASURER OF THE U. S. NAVAL INSTITUTE.

To the Officers and Members of the Institute:

Gentlemen:—I have the honor to submit the following report for the year ending December 31, 1905.

Itemized Cash Account.

Receipts During the Year 1905.

Items.	First Quarter.	Second Quarter.	Third Quarter.	Fourth Quarter.	Totals.
Dues	$ 1675 50	$ 514 95	$ 379 50	$ 500 69	$ 3070 64
Subscriptions	456 20	257 39	208 68	260 22	1182 49
Extra publications	1956 46	1810 21	8905 94	12202 29	24874 90
Sale of Proceedings	5 43	51 70	162 49	83 57	303 19
Advertisements	155 00	500 50	187 50	324 35	1167 35
Binding	12 00	5 80	6 60	....	24 40
Interest	228 85	104 28	166 50	148 00	647 63
Postage	2 58	1 06	1 12	6 69	11 45
Life fees	90 00	60 00	60 00	..	210 00
Bonds	1982 50	....	2115 00	5120 57	9218 07
Expressage	3 45	1 65	90	2 08	8 08
Premium on money orders	05	13	26	....	44
Credits	....	1 25	1 06	62	2 93
Premium on D. C. bonds	....	....	....	486 93	486 93
Totals.	$6568 02	$3308 92	$12195 55	$19136 01	$41208 50

EXPENDITURES DURING THE YEAR 1905.

Items.	First Quarter.	Second Quarter.	Third Quarter.	Fourth Quarter.	Totals.
Printing and binding Proceedings	$ 810 30	$ 802 21	$ 917 76	$ 618 32	$ 3148 61
Printing and binding extra publications	102 68	2888 74	5618 88	5222 04	13832 34
Purchase of articles	258 00	120 00	100 00	511 50	989 50
Salaries	585 00	585 00	585 00	585 00	2340 00
Postage	127 64	122 06	67 72	100 36	417 78
Telegrams	2 08	1 38	1 64	....	5 10
Expressage	21 07	25 96	32 75	36 72	116 50
Insurance	7 15	79 50	....	34 50	121 15
Freight and hauling	5 85	10 12	1 97	9 38	27 32
Discount on checks	2 86	1 60	....	....	4 46
Stationery	10 28	8 61	66 14	29 43	114 46
Furniture	....	6 00	19 75	....	25 75
Purchase of books	5 00	34 10	25 38	11 32	75 80
Check returned for endorsement	1 25	....	....	....	1 25
Purchase of bonds	1982 50	....	2115 00	5120 57	9218 07
Prize essay award	216 75	8 00	....	....	224 75
Honorable mention	75 00	....	....	....	75 00
Return of money paid in excess of cost of books	....	3 30	1 40	....	4 70
Authors of books	....	193 40	1020 00	610 00	1823 40
Cost of meetings of Institute	....	12 50	....	1 00	13 50
Commission to advertising agent	....	100 00	....	....	100 00
Rent safe deposit box	....	5 00	....	....	5 00
Sub. N. & M. C. directory	....	....	5 00	....	5 00
Purchase of back numbers of Proceedings	....	....	75	50 25	51 00
John Paul Jones miniature	....	....	3 00	....	3 00
Office expense	....	....	....	10 00	10 00
Transferred to reserve fund	....	....	....	540 00	540 00
American Bonding Co.	....	....	....	10 00	10 00
Advertising	....	....	....	19 00	19 00
Totals.	$4213 43	$ 5007 48	$10582 14	$13519 39	$33322 44

SUMMARY.

Balance of cash unexpended Jan. 1, 1905, including $330 00 held to credit of reserve fund	$14042 91
Total receipts for 1905	41208 50
Total available cash, 1905	$55251 41
Total expenditures, 1905	33322 44
Cash unexpended January 1, 1906	$21928 97
Bills receivable for back dues	945 90
" " " binding	12 00
" " " subscriptions	33 20
" " " sales	2560 00
" " " advertisements	523 50
Value of back numbers of the Proceedings	275 00
Institute property, furniture	200 00
Value of extra publications, including electrotype plates	2996 53
	$29475 10
Liabilities	1805 42
Total assets	$27669 68

RESERVE FUND.

Baltimore & Ohio and Northern Pacific bonds	$4623 14

The cash balance, $21928 97, unexpended January 1, 1906, is distributed as follows:

Seamen's Bank for Savings, New York, N. Y.	$3000 00
Rhode Island Hospital Trust Co., Providence, R. I.	2321 26
Society for Savings, Hartford, Connecticut	2297 74
Southern Railway bonds	2266 25
Washington Electric Railway bonds	1715 00
Northern Pacific and Great Northern bonds	5027 50
Potomac Electric Power Co's bonds	2115 00
Due general fund from reserve fund (bonds)	589 36
Cash in safe	55 08
Money orders in safe	43 93
Checks in safe	218 78
In the Farmers' National Bank, Annapolis, Md.	2279 07
	$21928 97

Respectfully,

PHILIP R. ALGER, *Professor U. S. Navy,*
Secretary and Treasurer.

LIST OF PRIZE ESSAYS.

1879.

Naval Education. Prize Essay, 1879. By Lieut.-Com. A. D. Brown, U.S.N.

NAVAL EDUCATION. First Honorable Mention. By Lieut.-Com. C. F. Goodrich, U.S.N.

NAVAL EDUCATION. Second Honorable Mention. By Commander A. T. Mahan, U.S.N.

1880.

"The Naval Policy of the United States." Prize Essay, 1880. By Lieutenant Charles Belknap, U.S.N.

1881.

The Type of (I) Armored Vessel, (II) Cruiser best suited to the Present Needs of the United States. Prize Essay, 1881. By Lieutenant E. W. Very, U.S.N.

SECOND PRIZE ESSAY, 1881. By Lieutenant Seaton Schroeder, U.S.N.

1882.

Our Merchant Marine: The Causes of its Decline and the Means to be taken for its Revival. "Nil clarius aquis." Prize Essay, 1882. By Lieutenant J. D. J. Kelley, U.S.N.

"MAIS IL FAUT CULTIVER NOTRE JARDIN." Honorable Mention. By Master C. G. Calkins, U.S.N.

"SPERO MELIORA." Honorable Mention. By Lieut.-Com. F. F. Chadwick, U.S.N.

"CAUSA LATET: VIS EST NOTISSIMA." Honorable Mention. By Lieutenant R. Wainwright, U.S.N.

1883.

How may the Sphere of Usefulness of Naval Officers be extended in Time of Peace with Advantage to the Country and the Naval Service? "Pour encourager les Autres." Prize Essay, 1883. By Lieutenant Carlos G. Calkins, U.S.N.

"SEMPER PARATUS." First Honorable Mention. By Commander N. H. Farquhar, U.S.N.

"CUILIBET IN ARTE SUA CREDENDUM EST." Second Honorable Mention. By Captain A. P. Cooke, U.S.N.

1884.

The Reconstruction and Increase of the Navy. Prize Essay, 1884. By Ensign W. I. Chambers, U.S.N.

1885.

Inducements for Retaining Trained Seamen in the Navy, and Best System of Rewards for Long and Faithful Service. Prize Essay, 1885. By Commander N. H. Farquhar, U.S.N.

1886.

What Changes in Organization and Drill are Necessary to Sail and Fight Effectively Our Warships of Latest Type? "Scire quod nescias." Prize Essay, 1886. By Lieutenant Carlos G. Calkins, U.S.N.

THE RESULT OF ALL NAVAL ADMINISTRATION AND EFFORT FINDS ITS EXPRESSION IN GOOD ORGANIZATION AND THOROUGH DRILL ON BOARD OF SUITABLE SHIPS. Honorable Mention. By Ensign W. L. Rodgers, U.S.N.

1887.

The Naval Brigade: its Organization, Equipment and Tactics. "In hoc signo vinces." Prize Essay, 1887. By Lieutenant C. T. Hutchins,

1888.

Torpedoes. Prize Essay, 1888. By Lieut.-Com. W. W. Reisinger, U.S.N.

1891.

The Enlistment, Training and Organization of Crews for our Ships of War. Prize Essay, 1891. By Ensign A. P. Niblack, U.S.N.

DISPOSITION AND EMPLOYMENT OF THE FLEET: SHIP AND SQUADRON DRILL. Honorable Mention, 1891. By Lieutenant R. C. Smith, U.S.N.

1892.

Torpedo-boats: their Organization and Conduct. Prize Essay, 1892. By Wm. Laird Clowes.

1894.

The U.S.S. Vesuvius, with Special Reference to her Pneumatic Battery. Prize Essay, 1894. By Lieut.-Com. Seaton Schroeder, U.S.N.

NAVAL REFORM. Honorable Mention, 1894. By Passed Assistant Engineer F. M. Bennett, U.S.N.

1895.

Tactical Problems in Naval Warfare. Prize Essay, 1895. By Lieut.-Com. Richard Wainwright, U.S.N.

A SUMMARY OF THE SITUATION AND OUTLOOK IN EUROPE. An Introduction to the Study of Coming War. Honorable Mention, 1895. By Richmond Pearson Hobson, Assistant Naval Constructor, U.S.N.

SUGGESTIONS FOR INCREASING THE EFFICIENCY OF OUR NEW SHIPS. Honorable Mention, 1895. By Naval Constructor Wm. J. Baxter, U.S.N.

THE BATTLE OF THE YALU. Honorable Mention, 1895. By Ensign Frank Marble, U.S.N.

1896.

The Tactics of Ships in the Line of Battle. Prize Essay, 1896. By Lieutenant A. P. Niblack, U.S.N.

THE ORGANIZATION, TRAINING AND DISCIPLINE OF THE NAVY PERSONNEL AS VIEWED FROM THE SHIP. Honorable Mention, 1896. By Lieutenant Wm. F. Fullam, U.S.N.

NAVAL APPRENTICES, INDUCEMENTS, ENLISTING AND TRAINING. The Seaman Branch of the Navy. Honorable Mention, 1896. By Ensign Ryland D. Tisdale, U.S.N.

THE COMPOSITION OF THE FLEET. Honorable Mention, 1896. By Lieutenant John M. Ellicott, U.S.N.

1897.

Torpedo-boat Policy. Prize Essay, 1897. By Lieutenant R. C. Smith, U.S.N.

A PROPOSED UNIFORM COURSE OF INSTRUCTION FOR THE NAVAL MILITIA. Honorable Mention, 1897. By H. G. Dohrman, Associate Member, U.S.N.I.

TORPEDOES IN EXERCISE AND BATTLE. Honorable Mention, 1897. By Lieutenant J. M. Ellicott, U.S.N.

1898.

Esprit de Corps: A Tract for the Times. Prize Essay, 1898. By Captain Caspar Frederick Goodrich, U.S.N.

OUR NAVAL POWER. Honorable Mention, 1898. By Lieut.-Com. Richard Wainwright, U.S.N.

TARGET PRACTICE AND THE TRAINING OF GUN CAPTAINS. Honorable Mention, 1898. By Ensign R. H. Jackson, U.S.N.

1900.

Torpedo Craft: Types and Employment. Prize Essay, 1900. By Lieutenant R. H. Jackson, U.S.N.

THE AUTOMOBILE TORPEDO AND ITS USES. Honorable Mention, 1900. By Lieutenant L. H. Chandler, U.S.N.

1901.

Naval Administration and Organization. Prize Essay, 1901. By Lieutenant John Hood, U.S.N.

1903.

Gunnery in Our Navy. The Causes of its Inferiority and Their Remedies. Prize Essay, 1903. By Professor Philip R. Alger, U.S.N.

A NAVAL TRAINING POLICY AND SYSTEM. Honorable Mention, 1903. By Lieutenant James H. Reid, U.S.N.

SYSTEMATIC TRAINING OF THE ENLISTED PERSONNEL OF THE NAVY. Honorable Mention, 1903. By Lieutenant C. L. Hussey, U.S.N.

OUR TORPEDO-BOAT FLOTILLA. The Training Needed to Insure its Efficiency. Honorable Mention, 1903. By Lieutenant E. L. Beach, U.S.N.

1904.

The Fleet and its Personnel. Prize Essay, 1904. By Lieutenant S. P. Fullinwider, U. S. N.

A PLEA FOR A HIGHER PHYSICAL, MORAL, AND INTELLECTUAL STANDARD OF THE PERSONNEL FOR THE NAVY. Honorable Mention, 1904. By Medical Inspector Howard E. Ames, U. S. N.

1905.

American Naval Policy. Prize Essay, 1905. By Commander Bradley A. Fiske, U. S. N.

THE DEPARTMENT OF THE NAVY. Honorable Mention, 1905. By Rear-Admiral Stephen B. Luce, U. S. N.

1906.

Promotion by Selection. Prize Essay, 1906. By Commander Hawley O. Rittenhouse, U. S. N.

THE ELEMENTS OF FLEET TACTICS. First Honorable Mention, 1906. By Lieut-Com. A. P. Niblack, U. S. N.

GLEANINGS FROM THE SEA OF JAPAN. Second Honorable Mention, 1906. By Captain Seaton Schroeder, U. S. N.

THE PURCHASE SYSTEM OF THE NAVY. Third Honorable Mention, 1906. By Pay Inspector J. A. Mudd, U. S. N.

NOTICE.

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It now enters upon its thirty-third year of existence, trusting as heretofore for its support to the officers and friends of the Navy. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers and communications upon subjects of interest to the naval profession, as well as by personal support and influence.

On the subject of membership the Constitution reads as follows:

ARTICLE VII.

Sec. 1. The Institute shall consist of regular, life, honorary and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fee to the Secretary and Treasurer, or to the Corresponding Secretary of a Branch. Members who resign from the Navy subsequent to joining the Institute will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control, and a vote equal to one-half the number of regular and life members, given by proxy or presence, shall be cast, a majority electing.

Sec. 5. Associate members shall be elected from Officers of the Army Revenue Marine, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control, and, if their report be favorable, the Secretary and Treasurer shall make known the result at the next meeting of the Institute, and a vote shall then be taken, a majority of votes cast by members present electing.

The Proceedings are published quarterly, and may be obtained by non-members upon application to the Secretary and Treasurer at Annapolis, Md. Inventors of articles connected with the naval profession will be afforded an opportunity of exhibiting and explaining their inventions. A description of such inventions as may be deemed by the Board of Control of use to the service will be published in the Proceedings.

Single copies of the Proceedings, $1.00. Back numbers and complete sets can be obtained by applying to the Secretary and Treasurer, Annapolis, Md.

Annual subscriptions for non-members, $3.50. Annual dues for members and associate members, $3.00. Life members fee, $30.00.

All letters should be addressed to Secretary and Treasurer, U. S. Naval Institute, Annapolis, Md., and all checks, drafts and money orders should be made payable to his order, without using the name of that officer.

John Paul Jones